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PROBLEMS IN
INDUSTRIAL ACCOUNTING

PROBLEMS
IN
INDUSTRIAL ACCOUNTING

BY

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PREFACE

The importance of accounting analysis in obtaining a picture of the efficacy of business management is now generally appreciated among those who carry the responsibilities of control. As the economist is vitally interested in the relation between human effort and the returns from it, so is the business man interested in the money outlays which his efforts involve, compared with the money income which results from them. The growing complexity of business makes it difficult to secure this picture by observation of physical facts; and increasing competition, with the narrowing margins between cost and income, has always stimulated study of the underlying facts.

The general recognition and acceptance of cost analysis in manufacturing companies has been followed by two outstanding developments: one is the application of similar methods to all phases of business activity, commercial, financial, administrative, and professional; the other is the growing informality and diversity of method by which the results are sought. The traditional course in Cost Accounting, with its prescribed routines, is no longer sufficient to reflect these conditions; it is necessary to present concrete and representative examples of the varied situations in which cost analysis serves, and of the adaptations of method which are made to fit these situations. So far removed are some of the variations from what has been regarded as orthodox, that the statement is sometimes made that a certain company "has no cost system," when the fact probably is that it has all the essentials of cost control worked out to a highly effective degree, but in an entirely novel form.

These case studies will, it is hoped, offer a sufficient variety of illustration to give a reasonably complete picture of the field. The business man and his accounting advisers can find here examples of what has been done in many situations, some of which must be analogous to their own; and the teacher will be able to present these cases to his students with confidence that they are practical and specific instances of the application of general principles which, when stated apart from their settings, are apt to be exceedingly confusing. Many of the admitted difficulties of teaching cost accounting probably arise from not distinguishing details of method from matters of principle, and from failure to show the precise circumstances which make a given procedure appropriate and successful.

More than enough problems involving practice material have been provided to satisfy the needs of a full year course. Some of these reflect the conditions of an entire industry. In the Waldron Paper Company series, particularly, the practices of the paper industry have been developed in stages convenient for periodic exercises.

This book is one of those made possible by the Arthur Lowes Dickinson Fund, given by Price, Waterhouse & Co., for Accounting Research at the Harvard Graduate School of Business Administration, being the third volume to appear under the auspices of that Fund.

Acknowledgments are gratefully made of the assistance received from several of the research assistants of the Accounting Department of this school, including Erle F. Saunders, George O. Cutter, Erle A. Steiss, and Wendell W. Finley; and of the diligent and accurate work of Miss Primrose Mason and Miss Grace Gaffney in preparing the manuscript through its various stages.

T. H. Sanders.

Soldiers Field,
Boston, Mass.,
December, 1929.

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PART I

SCOPE AND OBJECTIVES OF INDUSTRIAL ACCOUNTING

I

THE USES OF COST ACCOUNTING

A. GENERAL AND FINANCIAL ADMINISTRATION

1. Insulator Plate Company

NEED FOR COSTS: WHAT STEPS ARE NECESSARY TO DEVELOP A COST SYSTEM?

The Insulator Plate Company, a moderate-sized manufacturing concern, had operated on a reasonably profitable basis for a series of years in the manufacture of mica plates for insulation purposes. The volume of business had not increased to any great extent until recent years when the company began to receive orders from several large electric and automobile companies. During all the years of its operation the company had kept only the most meager records, and these pertained solely to the financial aspects of the business. These records consisted of a Cash Book, Sales Book, Ledger, and Purchase Record. The first three books mentioned were in the form that is commonly in use in business and need no explanation. The Purchase Record had the columnar headings shown on pages 4 and 5.

The records mentioned above had been kept by four people who were employed in the office. The sales correspondence and writing up of sales orders were done by one of the clerks; all matters relating to cash were taken care of by another; all the purchase orders and other matters pertaining to purchases were handled by a third; and the general bookkeeping, i.e., making the entries from all the original data, by a fourth. All the people in the office were cooperative, and although the records were not always up to date or complete, one usually could get the information desired by making inquiry in the office; for, if the facts wanted had not been entered in the books, someone in the office remembered them or knew where the data could be found. The production manager, who was in charge of the entire plant, never had thought of changing or of questioning the system, since the information he asked for was usually forthcoming and he never inquired as to its source.

PURCHASE RECORD

Date	Explanation	Accounts Payable Cr.	Freight Out	New Equipment	Office Salaries	Sundries	Heat, Light, and Power

Insulator Plate Co.

Form 1.—Left-hand page.

Financial and Profit and Loss Statements had never been presented with any degree of regularity because their construction depended upon a physical inventory count, and the inventory was taken only when business was slack or when, for other reasons, it was convenient. The production manager had endeavored to have these statements presented at least once every two months in order that he might have a statement for the directors' meetings, but sometimes this schedule had been broken and the statements had been presented only once in three months.

REASONS FOR COST INSTALLATION

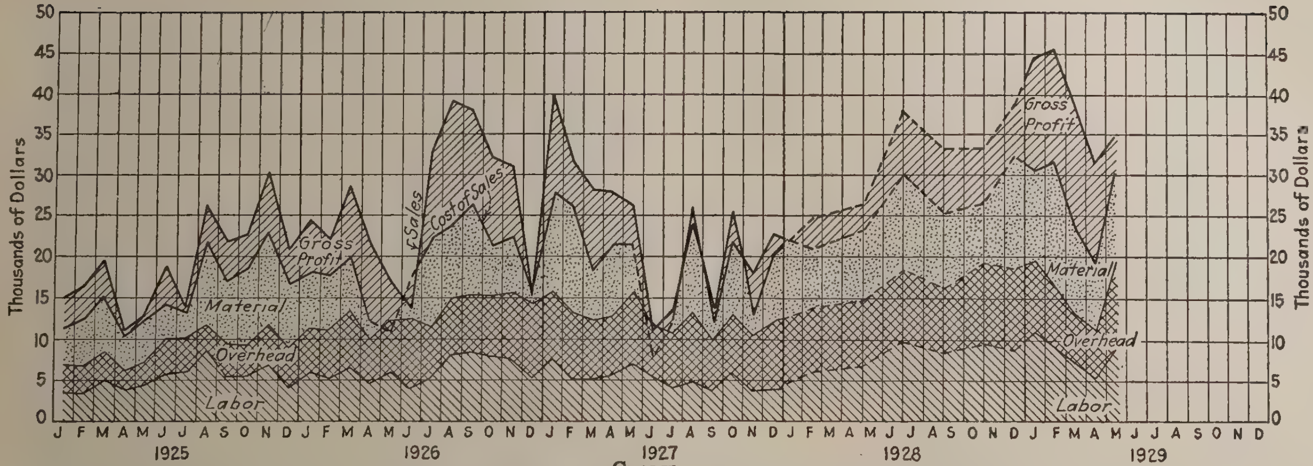
In 1928, when the company began to receive orders from large automobile and electric concerns, the volume of production increased to such an extent that the two conditions which had previously permitted the organization to function smoothly failed. These two conditions were the ability of the office clerks to supply information regardless of whether it was in the books or not, and the ability of the production manager to find convenient times at more or less regular intervals to count stock. The production manager for the first time was forcibly impressed with the idea that a new accounting procedure would have to be developed. The orders from the the big companies were received on a large scale, but shipments on these orders were made upon releases which were received upon short notice. It was impossible for the office help to remember all the details pertaining to the releases for orders. Consequently the information given to the production manager became unreliable, and sometimes, because the facts were so confused in the minds of the clerks that they could not remember what the situation was, it was not forthcoming at all. At the same time the production manager realized that the new orders had been taken upon a very small margin-of-profit basis and that it behooved him to have all the information possible relative to these accounts. Otherwise he might find that lack of adequate information pertaining to the large orders might seriously handicap him in ascertaining whether or not any profit was being made on them. He therefore employed an accountant to make a survey of his plant with a view to installing a cost system which would accomplish at least two things: first, eliminate the need for a physical inventory in obtaining a Financial and Profit and Loss Statement, and, second, provide accounts in the books which at any given time would supply information as to the profitableness or

PURCHASE RECORD

Non-Productive Labor	Explanation	Productive Labor	Maintenance	Freight In	Shipping Expense	Raw Material

Insulator Plate Co.

Form 1.—Right-hand page.



GRAPH I.

NOTE: *For 1918 the curves are plotted from data obtained by averaging the total figures for each three months period.*

unprofitableness of the business, especially of the business received from the large electric and automobile companies.

The accountant, in approaching the task assigned to him, had a graph prepared to show the trend of the company's business from 1925 to May, 1929, with a view to obtaining some idea of the influence which the new orders were having on production and to see clearly the relation of the three elements of costs. The graph (Graph 1) is given on page 6.

The graph shows clearly that the business of the company fluctuated considerably in 1925, 1926, and 1927; it also shows another feature which was of particular interest to the accountant, *i.e.*, that labor and overhead fluctuated very little during the period but that material varied considerably and the gross margin varied in about the same manner as did the material. Although the accountant was not certain, because he had as yet made no study of the situation, he wondered if the irregularity in gross margin had not been caused by an unreliable method of taking physical inventories. He did not think it was worth his while to make a direct study of this but hoped to eliminate the situation by developing an adequate perpetual inventory system. Because of the inadequacy of figures available for 1928, averages had to be used to complete the curves so that the material and gross profit curves were smoothed out over what they would have been if actual figures could have been used, as is noted on the graph.

DEPARTMENTAL BREAKDOWN

The next step was to make a survey of the plant to see what would be a proper departmentalization basis upon which to work out the costs. It was found that the production centers were fairly clearly defined as follows: plate laying—hand, plate laying—machine, ovens, mills, press, cut and trim, tubes, punch-mold, inspection, and shipping room. Since there was a variety of different plates going through the plant in as many different operation combinations, the accountant had a chart prepared (Chart 1) which showed the flow of these plates and was used as a basis upon which to establish accounts in the Cost Ledger, and later on in the installation process.

The chart shows clearly the flow of the work—the red lines indicating the process flow of the plates made by hand, and the black lines indicating the process flow of the plates produced by machines. Wherever there was a possibility of inventory accumulation within a department, indication was made of the fact, since that was a consideration in devising a cost system; any method used would have to account properly for the departmental inventories without necessitating a physical count. Plates were classified as "flexible" or "stiff." Flexible plates were all made by hand, and, for purposes of record, were all treated as a single group. Stiff plates were made by machine, and since they were of different thicknesses, they were classified into three main groups known as 1, 2, and 3.

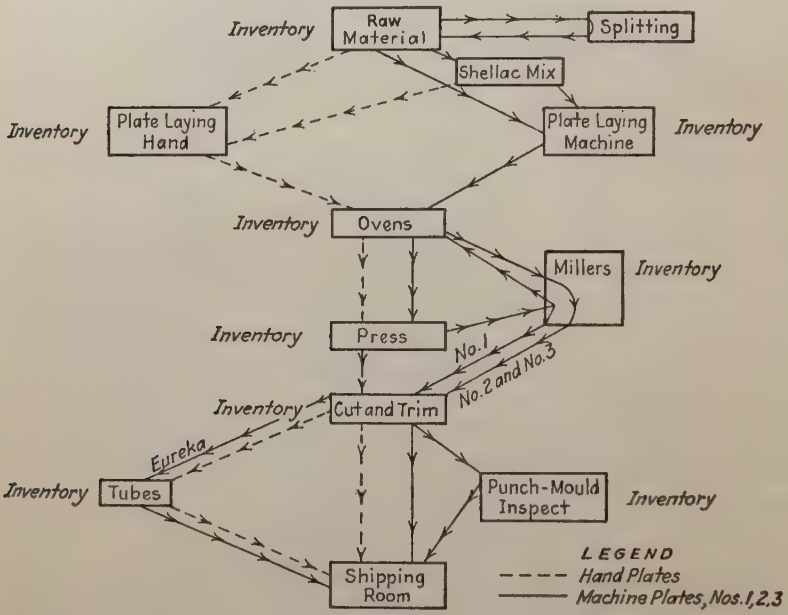

Inventory
Raw Material
Splitting
Shellac Mix
Inventory
Plate Laying Hand
Plate Laying Machine
Inventory
Inventory
Ovens
Millers
Inventory
Inventory
Press
No. 1
No. 2 and No. 3
Inventory
Cut and Trim
Eureka
Inventory
Tubes
Punch-Mould Inspect
Inventory
Shipping Room
LEGEND
---- Hand Plates
—— Machine Plates, Nos. 1, 2, 3

CHART 1.

There was some variation in numbers in addition to the ones mentioned, due to still further thickness variations, but these plates were usually produced on special runs and were not considered of especial importance at the early stage of the plant survey. The arrows, which seem to show that certain work went in a circle between the ovens, presses, and mills, indicated that because the thickness of the plates was not accurate as they came out of the ovens, it was often necessary to put them through the press and the mill a second, or even a third time in order to get the desired thickness. It was necessary that due consideration be given to this fact, as repetition of this sort was believed to be one of the reasons for high costs on some of the plates run, in so far as any idea of costs had been determined.

MATERIAL

Directing his attention to the raw materials used, the accountant found the following to be the chief ingredients in the plates produced:

No. 1 Amber Mica
No. 6 Subordinary Mica
No. 6 Ordinary Mica
No. 1 Pure Button Lac
Superfine Shellac
No. 6 Special Mica
Alcohol
Flexible Adhesive
No. 2 Adhesive
Wellston Adhesive
Pearl White Binder

Mica, the primary raw material, was weighed before use in every case, that used for hand plates being given out from the storeroom in small quantities in boxes, after proper measurement, to the various hand-plate workers as they required a new supply. Mica used in producing machine plates was measured in quantities of 125 pounds at a time, which at regular intervals were dumped into a rotary screen sieve which let the small pieces of mica drop down through a slide on to a conveyor belt which carried the mica through a vat of shellac, causing the pieces of mica to adhere together. Up to the time of the survey for the installation of a cost system, no record had been kept of raw materials, with the result that no one knew exactly how much raw material had been used. This frequently caused the concern to run out of its supply of material at times when it needed it most. Since the accountant believed, from his inspection, that process costs were more adaptable to this company than order costs, he thought that in accounting for material it would be unnecessary to have any forms of material requisitions, but that a good stores record of material in and out, which could be kept by the storeskeeper, would suffice.

The forms devised to record the materials used were divided into two groups: one to take care of the materials issued for the production of hand plates, and the other for materials used in the production of machine plates. A Daily Inventory Sheet (Form 2) was devised for the former purpose and the ounce was taken as a convenient unit of measurement.

MICA, HAND PLATE—DAILY INVENTORY SHEET

Date Sheet No.

Measured in Ounces

Special											6's—Ordinary						Paper			Re-split		

Insulator Plate Co.

Form 2.

This sheet recorded special mica, No. 6 ordinary, paper, and re-split mica. As can be seen, over half of the form was given to the recording of special mica because that was the chief raw material used. The storeskeeper entered in the various columns the weight in ounces of the amount of mica given out to the various workers during the day. Thus, all the cost department, which was yet to be organized, would have to do would be to total the columns in each of the divisions of the Inventory Sheet to ascertain the total amount of raw material used each day. In addition to the mica used for the production of hand plates, binder was also issued, and a Daily Inventory Sheet (Form 3) was devised to record the amount issued, the pint being taken as the unit of measurement.

Binder varied according to the type of plate produced and also according to atmospheric conditions which caused the company to mix its own binder from shellac, adhesive, and alcohol, in small quantities in order that the variation caused by atmospheric conditions would be small and the binder would have little opportunity to change before it was used in production. The Inventory Sheet was kept by the storeskeeper, and the number of pints issued of either flexible, Wellston, Coe and Young, No. 1, No. 2, or No. 3, was recorded, so that at the end of the day, as was the case in the mica Inventory Sheet, the total amount of binder issued was obtained by totaling the quantities in the various columns.

BINDER, HAND PLATE—DAILY INVENTORY SHEET

Date Sheet No.

Measured in Pints

Flexible						Wellston				Coe and Young		No. 1	No. 2	No. 3		

Insulator Plate Co.

Form 3.

Since the storeskeeper had not been accustomed to keep records, the accountant deemed it unwise to complicate the inventory forms by including prices; quantities only were to be kept, as already noted on the forms. The pricing was to be done in the office, on an average-price basis, by the person who was to be placed in charge of costs, this average being computed from the invoices received from the various companies from which the Insulator Plate Company purchased its material.

In the case of the material used for machine-plate production, Form 4 was devised to take care of the alcohol, mica, and shellac used because in the case of machine production the quantities issued were much larger and less frequent than in the case of hand-plate production.

MATERIAL REQUISITION, MACHINE PLATE

Date Sheet No.

	Alcohol		Mica				Shellac				Miscellaneous	
	New	Recl.	Sub.	Ord.		Wt.	No. 1	No. 2	No. 3	Gal.	Items	Qty.

Insulator Plate Co.

Form 4.

In Form 4 the "Alcohol" column was divided into "New" and "Reclaimed," this being necessary because a certain amount of alcohol from the binder was reclaimed as the plates went through the ovens. The alcohol could be used a great many times over before it finally lost its productive value. The columns for mica were much the same as on the hand-plate records; the same was true of the shellac. Because there might be variations in the mix from time to time, a "Miscellaneous" column was included for explanation or for recording the different types of material or ingredients that might have been used in the mix to change the gravity of the binder.

In order to have adequate control of the material used in producing binder, a Shellac Mixing Report (Form 5) was devised which allowed for the amount of liquid raw materials, such as raw shellac, alcohol, gasoline, and other ingredients that were used to produce a tank of binder.

Since the liquid raw materials were not used in their original condition but were purchased and entered into the inventory in that state, it was necessary to have this form to account for the material as it was issued, so that the inventory of binder could be charged with the cost of the raw materials used and the individual liquid raw material accounts could be credited.

On the right-hand side, the form, as can be seen, allows for the debit which is made to the shellac or binder account, according to whether it was No. 1, No. 2, or No. 3 binder produced. The labor used in producing the mix was small, and in order not to complicate the system, the wage cost of the mix was not included.

SHELLAC MIXING REPORT FOR SHELLAC INVENTORY

Date Sheet No.

	Credits					Debits			
	Raw Shellac		Alcohol		Gasoline	Miscellaneous Items	Shellac		
	But-Lac	Sup-Find	New	Recl.			No. 1	No. 2	No. 3

Insulator Plate Co.

FORM 5.

The information contained on the daily inventory reports described above was to be entered on a Perpetual Stock Record, the form (Form 6) for which is given on next page.

The Perpetual Stock Record was to be kept in book form as a Subsidiary Ledger, to be controlled by the Raw Material Account contained in the Cost Ledger; it had a page for each of the 11 raw materials previously listed. The accountant hoped, by adopting the Perpetual Stock Record Sheet, to have daily information as to the supply of materials on hand, so that ample notice could be given at any time by the cost clerk to the production manager when certain of the stocks were running low. This would enable the production manager to place orders for the quantities desired and thereby eliminate the possibility of

PERPETUAL STOCK RECORD

Purchased of

1____________________

2____________________

3____________________

4____________________

5____________________

Stock or Catalogue No.____________

Article__________________________________
(Full Description)

Location________________Aisle________Bin________

Maximum________Minimum________Unit of Measure________

Ordered				Received				Disbursed			Reserved			Balance on Hand	
Date 19—	Purchase Order Number	Quantity	Purchased of (Indicate by Above Number)	Date 19—	Requisition or Receiving Report Number	Quantity	Unit Cost	Date 19—	Requisition or Shop Number	Quantity	Date 19—	Quantity	For Whom	Quantity	Average Unit Cost

Insulator Plate Co·

Form 6.

the company's running out of material at a crucial point in production, as had so often been the experience under the old system.

LABOR

Little trouble was encountered in the handling of labor records; the concern had always used a time clock to record the employees' time in and out. The only thing the accountant felt it necessary to do in this regard was to have each time clock card clearly stamped with the department in which the particular individual was employed, in order that each department might be charged with its proper share of the payroll.

There was only one difficulty which confronted the accountant in the matter of wage distribution; during busy production periods a few men were likely to be shifted from one operation to another, which meant that either they would have to punch out their old card and punch in a new one, or some other record would have to be made relative to their transfer. The accountant was of the opinion that too much time would be lost if the employees punched in and out on the clock. He therefore suggested that the foreman of the particular department note on the individual's time card the approximate number of hours which the operator spent in another department. The cost clerk could then distribute the wage cost accordingly. Although this was not an exact method, the accountant thought that for all practical purposes it was sufficient.

BURDEN

All the items included under Burden were to be taken care of in the central office by the cost clerk, since the information relating to these items would be contained in the Purchase Record. A standard burden rate was not to be used at the outset, because it was possible, about the second or third of the following month, to have all the charges pertaining to burden entered in the Purchase Book for the prior month, so that these in turn could be broken down on a percentage basis to the departments to which they actually applied, thus enabling the accountant to use actual burden costs.

DEPARTMENTAL REPORTS

Since the raw material was at the very first process converted into a plate, and that plate passed on through the plant, receiving only additional machine operations but in no case having any more raw material added to it, the accountant believed that a method of accounting for plates and accumulating the cost of plates as they went through the plant would be satisfactory; this meant that the cost accumulated for a plate in the last department would be the total cost. In order that figures might be gathered to accumulate this cost, Form 7 was devised; it was to be used by all departments.

As can be seen, the form contained columns for "Plates Re-

DAILY DEPARTMENTAL COST REPORT

Date Department

Plates Received									Plates Forwarded								
	Number of Plates				Thickness of Plates					Number of Plates				Thickness of Plates			
From....	No. 1	No. 2	No. 3	Hd.	No. 1	No. 2	No. 3	Hd.	To......	No. 1	No. 2	No. 3	Hd.	No. 1	No. 2	No. 3	Hd.
Balance																	
Total																	

Cost Summary		Department Operator
Plates: No. Finished	Cost per Plate	Total
Labor: No. of Operators	Wage per Man	Total
Overhead: Rate	Applied to	Total

Remarks:

Department Cost

Cost Department

Insulator Plate Co.

FORM 7.

ceived" and "Plates Forwarded," and in this case, as in the case of raw material, only quantities were considered, as the costs again were easily obtained in the main office. Since the hand plate department and the machine plate department could produce only so many plates a day and an exact count of these was made, it was quite easy for these departments to make, on Form 7, an entry which would give the exact number of each of the different types of plates produced, with their thickness, and at the same time properly account for all plates that left the department to go to the next. Thus the cost accountant, by totaling the columns of the "Plates Received" and subtracting from this number the total of the "Plates Forwarded," could get the inventory of plates on hand in each department at any given time. The items contained at the bottom of the cost report were to be filled in by the cost clerk.

Taking the cost reports turned in from all departments each evening, the cost clerk had information at the beginning of the following morning, which he could enter on a columnar sheet to indicate for each department the number of plates received and plates forwarded and covered such information for the period of a month. The total of each of the columns on this sheet was then used for a journal entry to bring the departmental cost accounts in the Cost Ledger to date and to show in the ledger accounts the cost of production in each department.

DEPARTMENTAL ACCOUNTS

In the two plate-laying departmental accounts, "Hand" and "Machine," the debits comprised actual costs, since the material, labor, and burden costs, as already pointed out, were available several days after the close of the month. In the next departments all of the debits were not actual, as can be seen, because of the fact that a cumulative cost system was being developed, which meant that one did not know the actual cost of the plates transferred from one department to the next until the end of the month, which was too late a time to supply the exact cost of the plates that had been transferred currently during the month. Consequently, plates were transferred from one department to the next at a standard cost per plate, which meant that the debit in each of the plate departmental accounts had the accumulated cost on a standard basis for the plates received and actual costs for the labor and burden charges applied in the particular department. Since the exact inventory of plates was known at any given time, a credit could be made at the end of the month in each departmental account for the inventory balance on hand at an average cost, because such cost could be computed at the end of the month. During the month the account was to be credited currently for the plates forwarded at standard cost, so that the difference between the total debit amount and the credit amount (which was the sum of the plates forwarded at standard cost plus the final inventory figure at average cost) represented over or under standard charges in each department, and was to reflect the degree of efficiency at which that department was operating.

ACCUMULATION OF ACTUAL COSTS

The actual costs which were to be accumulated and debited to the various accounts were still to come from the Purchase Record, which was really a Voucher Record, as the cost accountant did not wish to make any more radical changes in the financial books of account than were absolutely necessary; he was afraid that too many changes might confuse the person keeping that record. As a consequence, the accountant kept the same old

PURCHASE RECORD

Date	Explanation	Accounts Payable Cr.	Freight Out	New Equipment	Office Salaries	Cost Ledger Control

Insulator Plate Co.

Form 8.—Left-hand page.

Voucher Register that the concern had always used and was able to adapt it to his cost program by employing the same size sheet but with a few more columns. The revised Purchase Record page (Form 8) looked as follows:

The revised form of Purchase Record was so constructed that all the columns on the left-hand page and the first one on the right-hand page contained information which was to be posted to the General Ledger. The remaining columns on the right-hand page were to contain information relating only to the Cost Ledger. The book was to be still self-balancing as the Cost Ledger and General Ledger control accounts would contain the total of each of the entries made. The book was to be kept by the same clerk as before; since there was no change in the layout, except for the control accounts, there was no reason why she should not be able to continue entering the information.

LEDGER ACCOUNTS

All the accounts in the ledger which contained cost information were taken out of the old ledger and placed in a new Cost Ledger. In addition to these, the accounts for the various departments were also set up in the Cost Ledger, so that the cost of operations might be recorded. The information for these accounts was supplied from the last seven columns on the right-hand page of the Purchase Record and from the various reports

PURCHASE RECORD

General Ledger Sundries	Explanation	Cost Ledger Sundries	Raw Material	Productive Labor	Non-productive Labor	Maintenance	Freight In	General Ledger Control

Insulator Plate Co.

Form 8.—Right-hand page.

on raw materials and departmental operations which were supplied from the various departmental foremen.

The cost clerk was to ascertain the cost of sales by applying a standard cost rate to the number of plates contained on the various sales orders. Thus, as in the departmental accounts, the Cost of Sales account was debited at standard and the Inspection Department, the last through which the plates had passed, was credited for the same amount. The variation in cost between actual and standard in the Inspection Department was to be accounted for in the same manner as such variations in the other departmental accounts, the amount of the variation being charged to Profit and Loss.

Do you consider an accumulative cost system sound for the Insulator Plate Company?

What advantage do you see in having columns for the Cost Ledger and General Ledger Control accounts in the Purchase Record?

Would you have altered the new system in any respect if you had been installing it?

Under the system installed, do you think the accountant had provided a method whereby the additional cost of re-running plates through the ovens, mills, and presses, as indicated on page 8, could be accumulated?

2. Newport Production Company

PHYSICAL INVENTORY: AT WHAT TIMES MAY IT BECOME NECESSARY TO TAKE A PHYSICAL INVENTORY?

The Newport Production Company had recently had a cost accounting system installed, one part of which was a perpetual inventory sytem. At the time of the installation of the cost system the accountant had encountered considerable opposition from the factory superintendent and several of the foremen; they contended that several of the operators had to do too much paper work and that material could not be properly accounted for unless actually counted.

After the cost system had been in operation for two months, the Profit and Loss Statement began to show a decline in profits, which, up until that time, had averaged about $12,000 net per month. The production manager became perturbed over the situation, as he had to report directly to an investment banker who was interested in the firm and also to the board of directors. The superintendent and foremen contended that the trend in profits only substantiated the truth of their statement that a cost system would not work. At the end of the fourth month the Profit and Loss Statement showed that the company had little better than broken even.

At this point the production manager called in the accountant who had installed the system to inquire of him how he would explain the situation. The accountant said that it might be that the perpetual inventory system was not yet working smoothly and, therefore, the inventory was throwing the profits out of line. On the other hand, it might be that the cost system was bringing to light for the first time the fact that the company was really not making any money. In order to ascertain which might be the true explanation of the situation, the accountant suggested that the company have a physical inventory taken the first of the following month. During the interim the accountant intended to check the figures contained in the various accounts he had established.

The raw material was accounted for under the cost system by Daily Inventory Reports, which contained the material received and the material issued. The manufacturing operations were such that a process cost system had been installed so that it was deemed best to have the storeskeeper record on the Daily Inventory Sheets the amount of raw material issued. The content of these sheets was summarized daily and entered in a Perpetual Inventory Ledger. At the end of the month columnar totals of the Inventory Ledger were taken which supplied the information to make a journal entry to show how much raw material had gone into work in process.

At the time the question arose as to the accuracy of the perpetual inventory system, only one Work in Process account was used; the accountant had not set up the departmental accounts because, after studying the personnel of the company, he thought

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it would be unwise to install too many new accounting features at once. The charges to the Work in Process account contained actual costs only, since it was comparatively easy at the end of the month to get the actual charges for material, labor, and burden. The credits to the Work in Process account were made up of two items; one, the cost of the goods completed and sold, the cost of which was determined by applying a standard rate against the number of articles sold as given in the sales orders, and two, the cost of the inventory in process at the end of the period which was priced at the average cost of production for the month in question which was ascertained by dividing the total of the charges by the number of units produced. There was usually a variation in the account because of the standard varying from the average. This variation was determined by balancing the Work in Process account, the amount, whatever it turned out to be, being charged to the Profit and Loss account. No finished goods inventory was kept because the company never produced for stock, the amount credited to Work in Process always being the amount sold and shipped.

The accountant checked over all the figures in the Raw Material and Work in Process accounts and was unable to find any errors. The only thing he discovered was that the cost of the articles produced had increased each month and that the costs increased in direct ratio as production decreased in the months when the volume of sales fell off. Since the variations in the Process account were not excessive and no error had been found in the figures, the accountant felt certain that when the physical inventory was taken it would check fairly closely with his book figures.

On the first of the month a physical inventory was taken and the total of it checked within $500 of the perpetual inventory figure. A part of the $500 discrepancy was accounted for by the fact that about $2,000 worth of material had been returned to the company and was included in the physical count at a value placed upon it by the production manager. None of the returned goods had been entered in the Perpetual Inventory accounts, as the cost clerk was not sure that the material had any salvage value. If this amount had been included, the discrepancy between the physical inventory and the book inventory would have been considerably less than 1%, which was a surprisingly close check.

When the production manager was apprised of the results of the physical inventory, he immediately called the superintendent and the foremen to his office and explained that the cost system was functioning accurately, and that the burden of bringing the company back upon a profit basis partly rested upon them in so far as the large orders which were on a contract basis were concerned. Since the contracts could not be broken, it was up to the production men to cut down the cost to leave a margin of profit. The sales department was to assume its share of the responsibility by seeking to obtain orders with smaller firms at higher prices.

What accounting entries would have been necessary if the discrepancy had been large between the physical and perpetual inventory figures?

Would it have been wise, if no trouble had arisen, for the cost accountant to have continued with the cost system without having a physical inventory taken?

How often would you say a physical inventory should be taken where a book inventory is always available, and upon what circumstances would the frequency depend?

3. Greencastle Pharmaceuticals, Inc.

FINANCIAL CONTROL: WHAT PART MAY COST ACCOUNTING SERVE IN EFFECTING A GENERAL AND FINANCIAL CONTROL OVER MANUFACTURING?

Before the war, Greencastle Pharmaceuticals, Inc., a consolidation of several old established concerns which made and sold high-grade pharmaceuticals and toilet articles, had been relatively free from competition. Under these circumstances, no necessity had been experienced for keeping much in the way of cost or inventory figures; but when, after the war, competition became very keen, some efforts to obtain manufacturing costs and gross margins were essential if the company's sales were to be maintained on a profitable basis. During 1928 and 1929, therefore, the minds of company officials had been concerned with methods of securing the needed information.

The company had not hitherto considered it necessary to keep detailed perpetual inventories; physical inventories had been taken every six months, usually with serious inconvenience and interruption of manufacturing activities, and operating statements for the entire company could then be obtained. Monthly statements, however, had not been available, nor could much information in the way of costs by lines of product be secured. It was probably desirable to do more in this way, if information could be obtained without too much detailed figuring. The company's catalogue included a very large number of items, and the management had not come to the point of considering it advisable to gather costs or keep inventories on these individual items; a way was being sought to give the essentials of control without going to that extent.

The numerous items of the company's line might be divided into about 80 major classes, and the question arose as to whether these classes might not be made the basis of a control. Within any one class there might be anywhere from 50 to several hundred items, and the difference in volume of work between figuring by classes or by items would be large.

Take the bismuth group, for example. Bismuth was the basic element in about 80 different articles; it constituted about 90% of the material cost of this entire group. So long as the formulas for the group remained the same, the ratio of bismuth to other elements, in quantity, at any rate, would remain the same. It might be possible to keep a Perpetual Inventory Card for bismuth, and to assume that other related materials maintained their proper proportions. The feasibility of this procedure was supported in part by the fact that the compounding formulas had to be exactly followed, so that the ratio of different materials put into process was bound to remain constant; if purchasing could be organized to follow the same proportions, the accounting process would be completed. In this way a control of raw material inventories and of work in process might be obtained with sufficient reliability to furnish monthly operating statements; and some way might be found to check up these computations to the extent of making them sufficiently reliable for the annual statements.

Was it necessary for the company to do more than it had hitherto done in the way of keeping records? If so, why?

Did the suggestion made furnish a probable solution?

What conditions would be necessary in order to make the plan work satisfactorily?

4. Waldron Paper Company—No. 1[1]

COMPANY'S RECORDS: WHAT BOOKS AND RECORDS ARE NEEDED BY A LARGE FIRM?

The Waldron Paper Company was located in a small town in western Massachusetts. It manufactured chiefly fine papers such as bonds, ledgers, cover stock, and papeteries and in addition a number of specialties. There were two buildings used by the company, one for its offices and the other for its mill. The office building housed both the general offices and the cost office; the mill building housed the productive departments. There were two major divisions in the company's work, first, general functions which were all performed by the general office, and, second, productive functions which were all performed by the paper mill.

The general functions included the Sales, Purchasing, and Accounting departments, which handled all the external transactions of the business, such as purchasing the various kinds of raw materials needed at the paper mill and selling the different grades of paper which the mill produced (in recent years the sales had averaged $1,000,000 per year). In addition, the general office took care of all the financial or general accounting.

The productive functions included all of the internal or interdepartmental transactions of the business. The company operated 5 paper machines and 24 other production centers which produced all the various types of paper sold by the company. There were 3 major divisions in the process of manufacturing paper; namely, the rag preparation and conversion process, the paper-making process, and the paper-finishing process. In addition, the paper mill, through its cost office, took care of all the cost or industrial accounting.

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[1] This is the first of a series of cases on the Waldron Paper Company; each case deals with a different phase of the company, and the whole series covers the company and its functions in their entirety. Where figures and schedules are worked out, they should be kept so that when the final case is presented all the information necessary to produce various cost sheets and a trial balance will be available.

The forms given in this series of cases are numbered consecutively for the series and not by individual cases.

BOOKS USED

The financial accounting division kept the following books: (1) General Journal, (2) Trade Sales Analysis, (3) Miscellaneous Sales Analysis, (4) Accounts Payable Register, (5) Check Register and Bank Balance, (6) Cash Received Register, (7) Customers' Ledger, and (8) General Ledger and Cost Control. The general accounting books and the cost accounting books were kept in the same or adjacent offices; this enabled the two divisions of the accounting department to pass the books of original entry back and forth so that the various entries could be made in control or subsidiary records regardless of whether they portrayed internal or external transactions. In addition it enabled the clerks of the two divisions of the accounting department to post the entries to the appropriate ledgers, either cost or general. A brief description of the books mentioned is given in the following paragraphs to explain their dual nature.

1. GENERAL JOURNAL

The General Journal had six columns rather than two, as found in the customary journal. The first two columns were for Sales Ledger—Accounts Receivable entries, debit and credit. The next two columns were for General Ledger entries, debit and credit. The last two columns were for Cost Ledger entries, debit and credit. Thus, it can be seen that this Journal was used by both the general accounting bookkeepers and the cost-finding clerks; the general bookkeepers entering transactions in the "General Ledger" columns and posting them to the General Ledger, the cost clerks entering transactions in the "Cost Ledger" columns and posting them to the Cost Ledger.

2. TRADE SALES ANALYSIS

The Trade Sales Analysis was a sales book for regular sales and did not vary to any great extent from the ordinary Sales Book. It contained space for the customer's name and columns for charges to Accounts Receivable, Hampton Paper Company (a subsidiary), Outward Freight and Cartage on Sales, Sales Discount, Regular Sales, Cash Sales, and Sundry General Ledger accounts; and credits to Accounts Receivable, Regular Sales, Reserve for Customers' Discounts, Reserve for Outward Freight and Cartage, and Sundry General Ledger accounts. During each day the previous day's billings were entered. Any charges to customers for special crating were credited in the "Cost Ledger Sundries" column to the Finished Stock Storage and Shipping account. This book contained no record of costs of sales.

3. MISCELLANEOUS SALES ANALYSIS

The Miscellaneous Sales Analysis differed from the Trade Sales Analysis in that it covered only miscellaneous sales and contained both records of such sales and data as to the cost of the goods sold. The sales data were handled in the same way as in the Trade Sales Analysis, for both records contained the same columns in this respect. In addition, columns were provided for debits and credits to Gain from Miscellaneous Sales, charges against Vendors, and debits and credits to Cost Ledger Sundries. The cost of the goods sold was handled by crediting the proper inventory account in the Credit—Cost Ledger Sundries column and debiting Gain from Miscellaneous Sales in case inventoried material was involved. When there was no inventory value, only the sales entry was made; or if in the nature of an offset to expense, the expense account involved was credited, the Miscellaneous Sales account was closed into Gain from Miscellaneous Sales account at the end of the period.

4. ACCOUNTS PAYABLE REGISTER

The Accounts Payable Register contained entries for transactions with vendors and others to whom the company became liable; invoices from vendors, freight bills, payroll sheets, and other records formed the basis for entries. This register was similar to a Voucher Register. The debit side of the page contained space for name of Vendor and columns for Purchase Discount, Inward Freight, Outward Freight, Goods in Transit, Account Number, General Ledger Sundries, Baled Rags, and Cost Ledger Sundries. The credit side of the page contained columns for Date Paid, Accounts Payable, Inward Freight, Goods in Transit, General Ledger Sundries, Account Number, and Cost Ledger Sundries. The credit to Accounts Payable was entered as soon as the invoices and other instruments were received. The debit, on the other hand, was not made in the case of invoices until the articles had been received and checked, and the freight and allowances figured out. If at the close of the period the Accounts Payable account contained a credit for which no debit had been made, because the goods had not yet been received, an offsetting debit was made to Goods in Transit. In starting the new period the Goods in Transit account was credited, while the proper debit distribution was made when the goods were received.

5. CHECK REGISTER AND BANK BALANCE

The Check Register and Bank Balance contained all entries involving cash disbursements; the daily bank balance also was shown. This book contained debit columns on the right-hand side of the page for Accounts Payable, Account Number, General Ledger Sundries, Cost Ledger Sundries; and credit columns on the left-hand side of the page for Check Number, Cash (Check), Purchase Discount, Inward Freight, Account Number, and General Ledger Sundries; an additional column was used to show the daily available bank balance. The bank balance of the beginning of the period was entered at the top of this column; at the end of the day the total of deposits for the day, as shown by the Cash Received Register, was entered and added to the beginning balance. The total of the checks written as shown in the Credit-Cash column in pencil was subtracted and the new balance for the next day obtained.

6. CASH RECEIVED REGISTER

The Cash Received Register was similar to the Check Register and Bank Balance Record. It had columns on the left-hand side of the page for Account Number, debits to General Ledger Sundries, Outward Freight, Customers' Discount, Cash (Deposit). There was a space in the middle of the page for the customer's name. The right-hand side of the page had columns for Folio and credits for Sales Ledger—Accounts Receivable, Account Numbers, General Ledger Sundries, and Cost Ledger Sundries.

7. CUSTOMERS' LEDGER

The Customers' Ledger was self-balancing and was controlled by the Accounts Receivable Control account in the General Ledger. The individual accounts in this ledger, as well as the control account, were debited and credited from the Trade and Miscellaneous Sales analysis and credited from the Cash Received Register. Occasional entries for adjustments were made to individual customers' accounts from the General Journal.

8. GENERAL LEDGER AND COST CONTROL

The General Ledger contained all of the financial or general accounts. One account among the assets, called Inventory Control—Paper Mill, controlled the Cost Ledger which dealt only with internal and interdepartmental transactions. Whenever the Purchasing Department, for instance, purchased raw material for the mill, an entry was made for the Accounts Payable Register by the general bookkeeper upon receipt of the invoices, as previously explained. When the posting was made to the General Ledger from those entries the Inventory Control—Paper Mill account was debited and the Accounts Payable account was credited. When the Accounts Payable Register was used by the cost clerk to post to the Cost Ledger, he posted the detail of the Cost Ledger Sundries column to the debit of the appropriate Raw Material accounts and credited the Inventory Control—General Office account with the total at the end of the month. Similar entries were made for payroll and expenses.

On the other hand, when the Paper Mill entered into a transaction for the benefit of the General Office, such as shipping finished stock to fill a sales order, the Inventory Control—General Office account was debited and the Finished Stock account was credited in the Cost Ledger. In the General Ledger, either the Cash or Accounts Receivable account was debited and Sales credited; to the account for the cost of sales, a debit was made to Cost of Sales, and Inventory Control—Paper Mill was credited. Thus the Inventory Control—General Office account in the Cost ledger was, at all times, if properly kept, in agreement with the Inventory Control—Paper Mill account in the General ledger.

Which of the books listed contain original entries for manufacturing costs?

What objection, if any, can be given to the system of having the same books of original entry contain both cost and general accounting data?

Was the company sound in entering the Accounts Payable in the Accounts Payable Register as soon as the invoices were received but deferring the debit entries until the goods were received?

Was the Customers' Ledger self-balancing, as stated in the problem? If so, how was it worked?

What would be the principal classes of entries in the General Journal?

5. Sammons Chemical Company

EXECUTIVE BONUS: HOW SHOULD A PLAN FOR AN EXECUTIVE BONUS SYSTEM BE WORKED OUT?

The officers of the Sammons Chemical Company had for some time been considering the advisability of a scheme by which they, as the company's principal executives, might receive a considerable part of their compensation in the form of a bonus. They had discussed it at length among themselves from time to time, and had sought advice and information from people outside the company who might be competent to make suggestions. As a result the considerations set forth in the following paragraphs had been assembled, and the question was regarded as being ready for decision.

If a substantial portion of the total compensation paid to executives came to them through a bonus based on the net profits made at the end of the year, a powerful incentive would be at work to enlist their most vigorous and intelligent efforts. The experience of companies similar to General Motors had indicated that the prospect of a generous reward based on actual profits acted unconsciously to stimulate interest to a degree not otherwise likely to be attained; it introduced into company organization something of the advantages of a man operating a business for himself.

Another advantage of the plan would be its effect in keeping down fixed overhead; salaries would be kept down at conservative figures, and in poor years would not operate too heavily as a burden on the company. When prosperity came, the executives would be well compensated at a time when the company could easily afford it.

PLAN OF BONUS SYSTEM

For the application of the plan it was proposed to make a list of those executives whose activities were likely to contribute to net profits fairly directly. If departmental executives could best show their skill and efficiency by making savings in their own department, it was considered better to set up specific standards for performance in their departments and to make their bonus relate to those standards. For this reason, the production manager and the sales manager would not necessarily be included in the list of executives proposed for bonuses on the profits basis: this list was made up as on the next page.

In Table 1, the Tentative New Salary column was added to adjust certain discrepancies which had recently arisen in the salary scale by bringing in new executives at high salaries, to which scale the salaries of the president and vice-president had not yet been adjusted. The Point Ratio column was designed to reflect each man's relative value to the company and his probable influence on net profits. It was then considered that 7% of the total capital used in the business should be deducted from net profits, and that of the remainder a certain percentage, yet to be determined, should be transferred to the bonus fund for distribution among the list of names in Table 1. For

TABLE I

LIST OF EXECUTIVES

Name	Position	Present Salary	Tentative New Salary	Point Ratio
A. J. Ballin	President	$11,000	$18,000	20
C. T. Storrs	Vice-President and Technical Manager	14,000	16,000	18
W. H. Meakin	Sales Manager	16,000	16,000	17
C. D. Robertson	Manager, South Street Plant	12,000	14,000	16
M. P. Foster	Manager, Beech Street Plant	12,000	14,000	16
F. M. Phillips	Research Manager	8,000	9,000	4
T. A. Garvin	Assistant Research Manager	7,500	8,000	3
S. O. Green	Treasurer	6,500	7,000	3
P. D. McAndrew	Purchasing Agent	6,000	6,000	3
				100

the remuneration of capital, 7% was considered a fair return or normal compensation; after the executive bonus had been provided, and any other necessary appropriations of profits made, capital invested would, of course, receive its share of the additional profits on some appropriate basis.

With regard to the names included in the proposed bonus list, those of the president and vice-president were considered as obviously eligible, since the activities of both of them pervaded the whole business and were the principal element in its success or failure. On the basis of what has been said about departmental managers, the names of W. H. Meakin, C. D. Robertson, and M. P. Foster might be regarded as ordinarily to be included in a departmental bonus plan, with bonuses computed upon their departmental profits; in the case of the Sammons Chemical Company, however, the influence of these three men extended beyond the boundaries of their own departments. They were consulted extensively in the development of new lines of product, in the improvement of equipment, methods and processes, and were consulted on all general policies of the company; no large matter was likely to be put into effect until their views had been obtained and considered. Under these circumstances, it was considered necessary to include them in the executive bonus plan.

The Point Ratio figures were expected to be used as a basis for apportioning the total amount of bonus available among the various executives. The figures in this column in Table 1 were the first figures of this kind which had been proposed, and it was understood that they were subject to further discussion and modification. It was considered important to bring these figures to the place where they deemed satisfactory to the participants themselves.

TABLE 2

ESTIMATES OF BONUS AMOUNT

(Based on Figures for 1928)

Capital Stock	$4,000,000.00
Surplus	1,000,000.00
Total Net Worth, June 1, 1928	$5,000,000.00
Net Profit for Year	850,000.00
7% Return on Net Worth	350,000.00
Net Profit on which to figure Bonus	$ 500,000.00
(1) Bonus on 5% Basis	$ 25,000.00
½ of 1% for Research	2,500.00
Amount for Executive Bonuses	$ 22,500.00
Value per Point	225.00
(2) Bonus on 7½% Basis	$ 37,500.00
¾ of 1% for Research	3,750.00
Amount for Executive Bonuses	$ 33,750.00
Value per Point	337.50
(3) Bonus on 10% Basis	$ 50,000.00
1% for Research Group	5,000.00
Amount for Executive Bonuses	$ 45,000.00
Value per Point	450.00

Table 2 showed a method of computing the amount of money available for distribution as executive bonuses. The total capital invested in the business was for this purpose taken to be the sum of the capital and surplus; interest on bonds was deducted from gross profits before net profits were arrived at. If, therefore, 7% interest on capital and surplus were allowed, the entire capital invested in the business would be provided for. Computations were made in Table 2 on the three separate assumptions that 5%, 7½%, and 10% of the residual profits would be available for executive bonus purposes; in each case, a separate allowance was made for the research group of men, and upon the remainder a value per point of the executive rating scale was obtained. The figure in Table 2 for Net Worth was the actual amount on a specific date, June 1; this was assumed to be a fair average for the year, but if the average proved to be something different, that average should be used rather than the amount on any particular date.

TABLE 3

COMPENSATION INCLUDING BONUSES

	New Salary List	Point Ratio	Compensation, Including Bonus, on 1928 Profits		
			5%	7½%	10%
A. J. Ballin	$ 18,000	20	$ 22,500	$ 24,750.00	$ 27,000
C. T. Storrs........	16,000	18	20,050	22,075.00	24,100
W. H. Meakin......	16,000	17	19,825	21,737.50	23,650
C. D. Robertson....	14,000	16	17,600	19,400.00	21,200
M. P. Foster........	14,000	16	17,600	19,400.00	21,200
F. M. Phillips.......	9,000	4	9,900	10,350.00	10,800
T. A. Garvin........	8,000	3	8,675	9,012.50	9,350
S. O. Green.........	7,000	3	7,675	8,012.50	8,350
P. D. McAndrew....	6,000	3	6,675	7,012.50	7,350
Totals............	$108,000	100	$130,500	$141,750.00	$153,000

Table 3 showed the effect of the various point values computed in Table 2, when applied to the individual executives. It would be necessary, if the scheme were adopted, to determine whether an amount equal to 5%, 7½%, or 10% of the residual profits should be distributed as bonus. Table 3 proceeded on the assumption that the bonus would be added to the existing salary scale and the question whether that salary scale had been liberal or conservative had considerable bearing on the amount of bonus which might be regarded as justifiable. The company, therefore, sought to compare its officers' salary scale with that of a number of other companies doing a similar volume of business, and it was found that the Sammons Chemical Company had hitherto been distinctly conservative in this respect; the addition of a 10% bonus would bring the total remuneration of officers about up to the level of those companies which seemed to be most comparable with themselves. Another point which arose was that of the officers who had been appointed most recently had been guaranteed an amount of annual compensation in excess of their regular monthly salary, and it was found that the addition of the 10% bonus brought their compensation approximately up to the guaranteed amount. The other officers' compensation would necessarily have to be brought into line and these considerations led to the favoring of the 10% bonus. This scale would have the effect of giving to the president a bonus which in a fairly good year like 1928 amounted to 34% of his total remuneration; for those at the bottom of the scale, 19% of their total remuneration would consist of the bonus. Other tables were constructed to indicate precisely what would be the effect on officers' compensation of the smaller profits which had been earned in other years.

With regard to the amount set aside for the research men, that is, the junior research men, it was considered that their work could not be regarded as being directly reflected in profits. It was, therefore, suggested that the research committee apportion the amount assigned to this department to the several men upon the basis of their judgment of the quality of the different men's work during the year. It was recognized that this was a very difficult thing to judge, and for the moment, at any rate, the company was unable to formulate any definite scale of measurement for these men.

Do you consider the proposed handling of the executive bonus plan to be satisfactory?

6. Tilden and Company—No. 1

MANAGEMENT ORGANIZATION: OF WHAT SIGNIFICANCE IS THE MANAGEMENT AND PERSONNEL ORGANIZATION IN THE DEVELOPMENT OF THE RECORDS?

Tilden and Company were manufacturers of fine stationery and similar finished goods who for some time had experienced difficulties, the last two years' profits having been very unsatisfactory. In their efforts to restore more favorable conditions, the management had requested a firm of accountants and management engineers to survey the company's business with a view to making improvements in its accounting system, and to make any other suggestions which promised to help the situation. After making a thorough study of the business, the consultants rendered a report in which the leading feature was a criticism of the company's organization at the top; they took the position that the main function of internal accounting was to measure the effectiveness with which the various functions of management were discharged, and to fix responsibility both for superior and for inferior performance. They considered, therefore, that it was of the first importance to have the lines of authority and responsibility clearly marked, as otherwise the accounting department could not function properly in reflecting how those responsibilities were being met. Before making any suggestions concerning the technical accounting procedure, therefore, the consultants proposed a number of changes in the management organization, which in their opinion were necessary to any improvement in the condition of the business. Their presentation of this matter was substantially as follows:

PRESIDENT: MR. ROBERT F. BANNER

Mr. Banner held the title of president, but for some time previous to the present investigation, the responsibility for the general management of the company had been transferred from him to an executive committee, and he had become practically a departmental manager, subject, as were the other departmental managers, to the direction of this committee. It had been the plan of this committee to rearrange his work so that he might be relieved of general administrative duties and devote his entire attention to the sales. Mr. Banner had previously been very successful as a salesman, and it was believed that he would render most effective service in supervising the salesmen of the company and the various local sales offices. One of his most important duties was to develop a new line of goods every six months; the company's position as a manufacturer of stylish and artistic stationery depended very much upon the attractiveness of these new lines. It appeared to the consultants, however, that this plan was not being fully realized, that Mr. Banner was not attending to some of the sales functions which were supposed to be under his care, but was devoting some attention to general administrative work and to purchasing and factory matters. A number of examples of this sort of thing were cited and Mr. Banner was quoted as stating in explanation that the committee had not made other arrangements for the satisfactory handling of these things and that consequently they devolved upon him, as they had done before the establishment of the committee. In short, Mr. Banner was, in effect, sales manager and general manager combined.

EXECUTIVE COMMITTEE

The executive committee consisted of Messrs. Harold P. Skinner, William Leader, and Frank H. Soder. All the members of this committee had other business interests which occupied the major part of their time and attention; Tilden and Company was a secondary though important interest with them. Of the three, Mr. Leader, who held the office of treasurer, devoted the greatest amount of attention to this business, but his work had been limited to the financial aspects of the company. No member of the committee had had experience in the technical aspects of this type of business. When organized, it was not intended that the committee should administer the detailed affairs of the company, but that they should be responsible only for general policies. Under this arrangement it had, as noted above, revised the duties of the president, and assigned much of the administrative work formerly done by him to an assistant manager. It had appointed a new factory superintendent and assigned the previous superintendent to the work of production scheduling and routing. It had also acted in an advisory capacity with the president as sales manager, and with the assistant manager and superintendent in regard to manufacturing problems. The consultants believed that the work of this committee had been handicapped by their lack of familiarity with the technical aspects of this type of business, and that this defect had been accentuated by their failure to establish definite lines of responsibility within the organization. It was believed to be a mistake for the committee to be dealing directly with so many officers of the company.

TREASURER: MR. WILLIAM LEADER

Mr. Leader was, as stated, the member of the executive committee who had devoted the most time to the business; he visited the office frequently and followed financial matters quite closely. In this he worked chiefly with the cashier and office manager, but sometimes with the assistant manager. It was noted, however, that the president also sometimes gave instructions for checks to be drawn and otherwise shared in the administration of office routine. Since Mr. Leader was the member of the committee to pay most frequent visits to the plant, he came to be regarded as a general representative of the committee, and was from time to time consulted as such by most of the executives.

ASSISTANT MANAGER: MR. JAMES F. ATWOOD

The original plan of the committee seemed to be that Mr. Atwood would assume all those duties which the president had formerly discharged, except those of sales manager. Later, however, a factory superintendent had been appointed by the committee, to be directly responsible to it, but developments were such that, while Mr. Atwood was supposed to have a general authority over both the factory and the office administration, the authority was not well defined and in all cases other executives shared the responsibility with him.

FACTORY SUPERINTENDENT: MR. THOMAS J. WILLS

Mr. Wills was a practical manufacturer with considerable experience and thoroughly familiar with the lines handled by the company, but he had been with it only a short time. The former superintendent, Mr. Richard Vallance, continued to lend a hand with organizing and scheduling production, and sometimes both the assistant manager and the president also took part in this work.

CASHIER AND OFFICE MANAGER: MR. EDWARD G. SERVICE

As cashier Mr. Service was directly responsible to Mr. Leader, who also advised him in matters of office management, though now and then Mr. Atwood and Mr. Banner gave him instructions in this sphere.

CRITICISMS OF THE ORGANIZATION

The consultants, in commenting upon this situation, stated that their first impressions of the lack of a satisfactory organization had been borne out by further study. They pointed out that the committee necessarily depended upon information and advice from several officials, though frequently this information was incomplete and contradictory. The confusion thus arising was accentuated by the fact that the permanent officials all seemed to be doing each other's business, with no definite lines of separation between their functions. It was mentioned that four different people were engaged in purchasing, and it had several times happened that the same item was ordered by different people on succeeding days. Not only were mistakes frequently made, but the morale of the organization was low.

RECOMMENDATIONS AS TO ORGANIZATION

It was accordingly advised that a general manager be appointed to have sole and absolute authority over the business. He might have the executive committee advise him and help him to determine general policies, but the committee should deal only with him. Definite lines should be laid down to determine on what matters the general manager should consult with the committee, it being understood that, subject to these, he was free to proceed in his own way with the administration of the entire business. In this all the other officers were to be subordinate to him and for each of these the spheres of responsibility and authority were to be definitely designated.

The consultants were insistent in their report upon the qualities which they considered necessary for this position, which they listed as follows in the order of their importance:

First—The initiative and sound judgment necessary to formulate definite plans, and the aggressiveness, resourcefulness, and persistence to carry them through in the face of any opposition.

Second—The ability to organize the work of subordinates, to delegate responsibility, and to enlist their whole-hearted cooperation.

Third—An understanding of modern methods of business administration, including sales organization, production methods, and a knowledge of how to use budgeting and cost accounting as a basis for control.

Fourth—Previous experience in the industry.

One exception only to this general plan was suggested, namely, that the treasurer, who would continue to be a member of the executive committee, might be directly responsible to the committee for the administration of the company's finances. It was believed that this could be done without interfering with the general manager of the business as a whole. The other executive officers would be:

A sales manager was to have complete responsibility for all sales work and report as such to the general manager. It was urged that the sales manager should spend a good share of his time in the field making actual sales, both because this would better acquaint him with market conditions, and also because his administrative duties need not occupy the whole of his time. He was to have no authority over office or factory work.

A factory superintendent was to have similar responsibility with regard to all manufacturing and related services.

A controller was to be appointed to take charge of all office work and be responsible for all reports and statistics. He was to be equal in authority with the sales manager and factory superintendent.

A purchasing agent was to handle all purchases, under the direct responsibility of the general manager. He was to purchase only upon requisition by factory departments, these requisitions to be approved by the general manager.

What do you think of the propriety of permitting outside consultants to comment in this way on the organization of the business?

Do you think their criticisms were well founded?

Do you approve of the recommendations which they made?

If these recommendations were adopted in principle, how far do you think the various offices suggested could be filled from the present personnel?

Were the consultants right in their view that effective internal accounting was impossible without an effective organization?

7. Rembrant Piano Company

EXECUTIVE CONTROL: WHAT INFORMATION CAN THE COST DEPARTMENT RENDER TO THE MANAGEMENT IN RELATION TO INVENTORY AND SALES POLICIES?

Upon the death of the president of the Rembrant Piano Company, the Board of Directors selected for the position a man without experience in the piano industry, but who had been successful in the management of a number of other concerns engaged in different lines of work. The new executive immediately wished to become familiar with the special aspects of the piano industry and asked the controller for such financial statements as he was able to furnish. In addition to the company's own statements the controller presented a typical balance sheet, as he had compiled it from published sources by averaging the balance sheets for 10 concerns in the trade, as follows:

Balance Sheet
Typical Piano Company

Assets			
Cash	$ 466,322		
Receivables	2,347,378		
Inventories	2,112,920	$4,926,620	
Investments		603,134	
Plants and Equipment		1,890,876	
Prepaid Items, etc.	$ 101,900		
Trademarks, Patents	613,973		
Goodwill	500	716,373	
Total Assets			$8,137,003
Liabilities			
Notes Payable	$ 668,113		
Accounts Payable	238,773		
Current Liabilities		$ 906,886	
Deferred Credits, Reserve for Taxes, etc.		152,510	
Bonds and Mortgages		397,079	
Reserves		440,770	
Net Worth:			
Common Stock	$2,800,000		
Preferred Stock	1,700,000		
	$4,500,000		
Surplus	1,739,758	6,239,758	
Total Liabilities, Capital Stock, and Surplus			$8,137,003

A comparison of the balance sheet of the company with the typical one for the industry showed a close similarity between the two, the outstanding feature being the large amount of money tied up in inventories and receivables, making the current ratio approximately 5.4 to 1.

The controller pointed out that the long manufacturing periods required to produce pianos, the stock carried in the different lines, together with the trade practice of selling on a deferred-payment basis, accounted for the size of the current items. He, however, furnished the information that one of the largest companies in the trade had, by simplifying the lines it handled, been able to decrease its inventories approximately 50% and its accounts receivable about 40%.

Although the president was aware that the different position in the industry held by this other company might prove to be the fundamental reason why it had been able to reduce its current items so substantially, yet he considered it worth while to make a thorough study of the problem in his own company. He recognized that curtailment of inventories would probably involve to some extent a revision of both production and sales policies, while the reduction of accounts receivable was essentially a sales problem. However, before discussing the matter with those departments, he wished to have sufficient information on which to form an independent opinion of the practicability of such a program, and, therefore, asked the cost department to furnish him with the data he would require to understand the existing situation.

What types of information should the cost department include in its reports?

8. Waldron Paper Company—No. 2

TRIAL BALANCES AND TRANSACTIONS: WHAT BALANCES AND ENTRIES WERE TO BE MADE IN THE BOOKS?

The ledgers of the Waldron Paper Company contained 95 accounts; 45 were in the General Ledger, and 50 were in the Cost Ledger. A list of these accounts and the balances in them on February 1 are given on the following page.

Trial Balance

General Ledger as of February 1

1. Cash	$ 148,300	14. Wages and Salaries Accrued	$ 18,200
2. Accounts Receivable	350,100	15. Accounts Payable	65,100
3. Notes Receivable	70,200	16. Notes Payable	49,700
4. Investments	104,900	17. Taxes Accrued	10,000
5. Inventory Control—Paper Mill	469,000	18. Interest Payable Accrued	30,200
6. Inventory—Goods-in-Transit	4,350	19. Water Power Rent Accrued	3,000
7. Fixed Assets—Paper Mill	3,275,000	20. Preferred Dividends Payable	7,000
8. Other Fixed Assets	6,300	21. Reserve for Bad Debts	30,000
9. Construction in Process	5,650	22. Depreciation Reserve—Paper Mill	950,300
10. Insurance Unexpired	4,800	23. Depreciation Reserve—Other Assets	2,900
11. Interest Receivable Accrued	3,200	24. Bonds	1,000,000
12. Organization Expense	68,500	25. Preferred Stock	200,000
13. Patents, Copyright, Goodwill, etc.	50,000	26. Common Stock	1,500,000
		27. Surplus	598,300
		28. Current Profit and Loss	95,600
	$4,560,300		$4,560,300

Other Accounts in General Ledger

29. Regular Sales
30. Cost of Sales
31. Sales Discounts
32. Outward Freight and Cartage on Sales
33. Selling Expenses
34. Administration Expenses
35. Interest Earned
36. Interest Charges
37. Special Income
38. Special Charges
39. Charges on Unused Space and Equipment
40. Interest Charged to Cost
41. Inventory Adjustment
42. Gain from Miscellaneous Sales
43. Purchase Discounts Not Taken
44. Earned or Unearned Burden
45. Reserved for Outward Freight and Cartage.

In the company's chart of accounts the following Selling Expense accounts were listed: Salaries, Traveling, Advertising, Office (which included fixed charges), Bad Debts Written Off, and Allowances on Sales; one account is used here for sake of simplification. Under the caption "Administration Expenses" were listed accounts for Salaries, Traveling, Office (which included fixed charges), and Professional Services. These have all been grouped in this problem under the heading of Administration Expenses.

The Interest Charged to Cost account was used for the interest figured on the fixed assets, and was treated as a gain account.

TRIAL BALANCE

COST LEDGER AS OF FEBRUARY 1

		Debit	Credit
1.	Rags	$ 64,000	
2.	Soda Pulp	28,000	
3.	Sulphite Pulp	49,000	
4.	Miscellaneous Pulp (includes Broke)	10,000	
5.	Shavings	13,500	
6.	Outthrows	2,500	
7.	Rosin	6,000	
8.	Soda Ash	2,000	
9.	Tub Size	4,000	
10.	Fillers	4,000	
11.	Other Chemicals	2,000	
12.	Color	2,000	
13.	Coal	18,000	
14.	Wires and Felts	30,000	
15.	Plater Books	3,000	
16.	Supplies	22,000	
17.	Dressed Rags in Process	2,500	
18.	Half Stock	15,000	
19.	Paper in Process	41,950	
20.	Reserve for Maintenance		$ 450
21.	Finished Stock	150,000	
22.	Inventory Control—General Ledger		469,000
		$469,450	$469,450

OTHER ACCOUNTS IN COST LEDGER

23. Raw Stock Handling and Storage
24. Rag Preparation
25. Rag Cooking
26. Rag Washing
27. Drainers and Stock Digging
28. Paper Pulping
29. Size Making
30. Paper Machine No. 1
” ” No. 2
” ” No. 3
” ” No. 4
” ” No. 5
31. Loft Drying
32. Calendering
33. Pasting and Ruling
34. Plating
35. Sorting and Counting
36. Trimming
37. Wrapping and Sealing
38. Finished Stock Storage
39. Water Supply
40. Steam
41. Power
42. Maintenance
43. Building Expense
44. Case Making
45. Trucking
46. Hospital
47. General Manufacturing Burden
48. Unused Space and Equipment
49. Selling
50. Administration

All of the accounts from 23 to 47 were burden accounts which were closed out at the end of each month. The first four accounts were closed into Dressed Rags in Process, while the accounts from Drainers and Stock Digging to and including Finished Stock Storage were closed into the Paper in Process account. The accounts 39 to 47 represented service departments and were redistributed on the Burden Distribution

Sheet to the 20 direct producing departments. The accounts from 48 to 50 were not distributed to the producing departments, but were cleared through the Inventory Control—General ledger to the General Ledger, where they were charged to Profit and Loss.

In the figures accompanying this problem the five Paper Machine centers are lumped together for convenience. In actual practice they were always kept separate because the costs on different machines—no matter how similar—tended to vary considerably.

The financial transactions for the month of February were as follows:

SALES

The Sales Analysis book showed the following totals for the period:

Sales	$270,500
Sales Discount	5,300
Outward Freight and Cartage	1,600 [1]
Allowance on Sales	800

The sales of $270,500 were on account, and included Discount, Outward Freight and Cartage, and Allowance on Sales. The cost of sales as summarized from the sales sheets is $236,425.

PURCHASES

The Accounts Payable Register shows the following purchases:

Rags	$58,600
Sulphite Pulp	29,000
Soda Pulp	16,000
Shavings	8,000
Tub Size	2,700
Rosin	3,400
Filler	3,500
Color	1,100
Wire and Felt	6,500
Coal	7,900
Supplies	5,800
Plater Books	500
Total	$143,000

[1] Outward Freight and Cartage was an estimated amount of the allowance to be made to customers; credit Reserve for Outward Freight and Cartage. When customers take the actual deductions, credit Accounts Receivable and debit Reserve. Then close Reserve into Outward Freight and Cartage, and the latter into Sales.

CASH BOOK TOTALS

Received:	
On Accounts Receivable	$302,900
Notes Receivable	35,100
Interest on Investments	600
	$338,600
Disbursed:	
Accounts Payable	$125,200
Notes Payable	2,500
Direct Labor (charge wages and salaries accrued)	21,200
Indirect Labor (charge wages and salaries accrued)	57,100
Selling Expenses	18,300
Administrative Expenses	10,600
Insurance	15,750
Preferred Dividends	7,000
Interest	32,100
Water Power Rent	3,100
	$292,850

ACCRUALS

Interest Payable	$5,065
Interest Receivable	250

The Interest Payable amount of $5,065 was debited to Interest Charges and the Interest Receivable amount was credited to Interest Earned.

The actual allowance to customers on Outward Freight and Cartage was found to be $1,600 for the period.

Set up the General Ledger and enter the balances given on the trial balance in the proper accounts.

Set up the Cost Ledger in like manner.

Make the journal entries necessary to record the transactions given.

B. PRODUCTION EXECUTIVES AND THEIR ACCOUNTING NEEDS

1. McCauley Jewelry Company

COST RECORDS: CAN ANY CONTROL BE HAD OVER PRODUCTION WHEN NO COST RECORDS ARE KEPT?

The McCauley Jewelry Company specialized in the manufacture of fraternity and sorority pins, all kinds of jewelry with college and fraternity seals, stationery and calling cards, and dies for coats of arms. The business, by its nature, was highly seasonal because the heaviest sales were made prior to the holiday season and to the fraternity pledging and college graduating periods. All production was for order, but the orders were usually small, which meant that great confusion was experienced in various departments during peak periods because of the multiplicity of small orders. Fraternities and sororities purchased the products they desired on a C.O.D. basis, receiving a 20% rebate from the company, while college supply shops and similar stores made their purchases upon the conventional basis of 2%—10 days, net 30. There were approximately 20 firms operating in the industry, which caused competition to be unusually keen and prices to vary from time to time.

Although the company was 15 years old, little had been done in the way of accounting, but the president justified the situation on the basis that the company had grown so rapidly that many production difficulties had arisen which it was necessary to solve first. In spite of the fact that the records were meager, it was obvious that the company was profitable and that its business was continuing to grow.

Recently in the pin and coat of arms department, which was one of the six production departments, there had been some confusion and production had been retarded. Two men of equal rank had been trying to operate the department, but, due to conflicting ideas, production activities became muddled. In order to iron out the difficulties, the president of the company hired a new man, who had had considerable experience in the business, to take charge of the department. The first thing the new production manager requested was the records of the past performance of the department so that he might see where mistakes had been made and plan a campaign of reorganization. The president explained that the records desired had never been kept, because the various executives and department managers had concentrated their attention upon solving production difficulties; the only cost data available was the cost to produce a sample of the various items manufactured. In addition, he said, he was of the opinion that detailed cost data on individual orders could not profitably be collected where there was a multiplicity of small orders. The new production manager was under the impression that one of the causes for the confusion in the pin and coat of arms department was the lack of records, and that production control and cost records had to go hand in hand and that he could not iron out his difficulties if he did not have records. Although the president was anxious to straighten out the production problems first, he said that the new manager was to be responsible for the department to which he was assigned and that it was up to him to straighten out matters; to accomplish this end the new manager could do anything he liked.

The new manager, realizing that he had nothing to work on, decided that his first step should be that of placing all employees within his department upon a piece work basis, keeping cards for each employee which would show the number of pieces produced and wages per employee earned. The data accumulated on these cards he was going to use to make comparisons to discover which of the employees seemed to be the best producers and what the possible increase in production might be. The manager realized that as wages began to increase materially he would have to reduce the piece rate so that the wages paid in his department would not be too much out of line with the other departments. As to further changes in his policy he would have to wait until experience and reports gave him sufficient data which could be used as a basis for further elaboration of a control system. Material was not to be considered at the outset because, with the exception of gold, it was not a large element in cost and was a comparatively easy item to control. Burden was fairly high, but since this could be most satisfactorily handled upon a labor basis, he could do nothing about it from a recording standpoint until the labor difficulties had been cleared up.

Can production control be reduced to a systematic basis without adequate cost data?

Would the new production manager's approach to this problem help him to any considerable extent when none of the other departments were developing similar systems of control?

2. Wood Brothers Equipment Company

NEED FOR COST ACCOUNTING: AT WHAT STAGE IN A COMPANY'S GROWTH MAY COST ACCOUNTING BECOME NECESSARY?

The Wood Brothers Equipment Company had been formed as a small concern to enter the general machinery and equipment trade and, as the organization had progressed steadily, it had become one of the leaders in its line of business. The products were well known throughout the country and, as would be expected in that type of work, most of the orders received were on installation jobs where the regular equipment had to be adapted to special conditions or machinery of entirely new design had to be constructed.

The executives of the company had been cautious in their application of the principles of scientific management to the organization. In the factory this policy had resulted in placing the responsibility for the methods being used on the foreman of the different departments, whom the management considered capable because of their long experience on the type of work done by the company. Further, they did not wish to antagonize the foremen by introducing changes which might be regarded as a reflection on their ability.

The cost accounting procedure used had been slowly developed as the need for the information that it could furnish was felt. Requisitions were not used in the factory to account for the stock required for the different jobs, so that material costs were developed from specifications and stock part lists made up in the engineering department. Time records were made out in the shop for all operations when they were performed, after which they were forwarded to the cost department where they were filed under job number. These forms, in addition to giving the time spent on the work, also showed whether the job was on a day- or piece-work basis and the rates to be used in the calculation of the labor charges. Burden was distributed to the different jobs when their costs were calculated by the use of departmental rates based on the elapsed time required to perform the different operations.

The information thus obtained by the cost department was sufficient to enable them to make up cost sheets for any work passing through the factory, but in the operation of the system relatively few cost sheets were actually completed. All the management desired to know was trends of production cost on the regular work, and the way in which they accomplished this was to have cost sheets made up at stated intervals for specific lots of the standard lines of products that were being processed. In the case of special work, costs were not accumulated unless they were requested by some executive and no attempt was made to "tie in" the cost and financial accounts in order to obtain a complete check on operations. The procedure as carried out might be termed "sample costs" and was considered quite satisfactory by the management in meeting the needs of the company and furnishing them with all the information that they deemed necessary.

This attitude was encouraged by several conditions existing in the organization. In the first place the results obtained from the system appeared to be satisfactory, as it was pointed out that the costs of all their standard lines were carefully watched so that any unsatisfactory conditions would be quickly noted. Further, because of their long experience they were able to estimate closely the expense of doing the special work so that they did not need to know the cost of each job when completed. Another consideration was that a large cost department would be required if complete records were kept, as so much special work was being done in the factory that it would require a considerable amount of detailed clerical labor, while the present procedure needed relatively few clerks. However, the principal reason for this attitude was probably that profits had been and continued to be satisfactory, so that the need for further investigation to show how costs might be reduced was not emphasized.

What might have been accomplished if a comprehensive survey of operations had been made was indicated by the results obtained by the management when the cost records showed that the profit on some standard lines was becoming so low as to be unsatisfactory. When this condition prevailed, they had usually been able, by changing the methods in the shop, to reduce expenses sufficiently to give them a reasonable margin. With somewhat the same result a large number of jobs had been changed over from a day-work to a piece-work basis with a resulting increase in the efficiency of labor of about 27½%.

Is a satisfactory profit showing sufficient to warrant a company in concluding that its system of accounting is adequate?

Would a complete cost accounting system have aided the management in determining where and how savings might be made in the factory?

3. Waldron Paper Company—No. 3

OPERATIONS AND DEPARTMENTAL REPORTS: WHAT REPORTS ARE NECESSARY FOR THE OPERATIONS IN THE RAG PREPARATION AND CONVERSION PROCESSES?

The making of paper in the Waldron Paper Company was divided into three major processes: Rag Preparation and Conversion, Paper Making, and Paper Finishing. The first of these covered seven operations, which were: (1) Rag Handling and Storage, (2) Rag Preparation, (3) Rag Cooking, (4) Rag Washing, (5) Drainers and Stock Digging, (6) Paper Pulping, and (7) Size Making. A description of these operations and the cost reports used in conjunction with them are given in the following paragraphs.

1. RAG HANDLING AND STORAGE

Rags were purchased by grades in varying quantities; they were received in bales which were generally not uniform in weight, varying between 300 and 700 pounds. The rags were purchased on a bone-dry weight basis, but during shipment and storage they absorbed moisture, so that their weight increased before they were put into process. This moisture content was not easily measured, and the accuracy of measurement usually depended upon the skill of the workmen handling the rags. Great skill was also required in grading rags, for dark-colored rags could not be perfectly bleached and therefore could not be used in making white paper; they were used in producing colored papers only. Cotton and linen rags were most satisfactory for making paper, while woolen rags were not so suitable.

The vendor's invoice specified the quality of rags by grade name, total number of bales, weight, unit price, and total value. When the rags were received at the mill, the total quantity of each invoice was known as a "lot" and assigned to a lot number. As the bales were weighed, a tag was attached to each on which the vendor's name, lot number, grade name, bale number, and bale weight were recorded. This information was of use in filling out bleach orders.

RAG ROOM REPORT

Time Sheet Date

No.	Employee Name	Grade				Grade				Total			
		Bleach No.				Bleach No.							
		Hrs.	Lbs.	Rate	Cost	Hrs.	Lbs.	Rate	Cost	Hrs.	Lbs.	Rate	Cost
1													
2													
3													
4													
5													
	Soda Ash												
	Lime												
	Total												

Waldron Paper Co. No. 3

Form 1.—Front.

2. RAG PREPARATION

The bales of rags were broken open when the rags were started through process, and a record was made of the weight of the wrappers and binders; these, together with the dust from the thrasher and the discard, such as "woolens" and "muss," in the

RAG ROOM REPORT

Stock used Grade

Name	Date of Inventory	Number of Bales	Grade	Weight	Bleach Number	Price	Amount
Lot No. 525 Lot No. 1026, etc.							
Total No. 1 Grade No. 2 Grade No. 3 Grade No. 4 Grade							
Special Sacking Muss Dust Woolens							
Total							
Lot No. 238 Lot No. 938, etc.							
Total No. 1 Grade No. 2 Grade No. 3 Grade No. 4 Grade							
Special Sacking Muss Dust Woolens							
Total							

Waldron Paper Co. No. 3

FORM 1.—Back.

sorting and overlooking operations, were termed "rag room recoveries" or "outthrows." This waste in many instances could be sold to cardboard manufacturers, so that there was some recoverable value in it. The rags were fed into a thrasher or dusting machine which removed the loose dirt and dust. The waste in the form of dust and dirt was weighed and recorded for each bleach order. The rags were then delivered to the sorting room in large baskets having casters on the bottom, and there dumped on benches. Here women sorted out any objectional material, removing buttons and metal clasps, and cutting up large pieces. As the baskets were refilled with sorted rags, they were weighed and delivered to the overlookers. A great deal depended upon the efficiency of the women sorting rags; the overlookers performed a second sorting of the better grades of rags, which were dumped on the table for inspection, the net weight being recorded again. Although rags were supposed to be baled by grades, there were usually good rags of other than the specified grade in any given bale; during the second sorting, these rags were taken out, sorted by their grades, weighed, and dumped into bins for use on bleach orders that called for such grades. These grades were shown on the back of the Rag Room Reports under headings of No. 1, 2, 3, or 4. This report (Form 1, pages 52 and 53) served as a record for both labor expended and materials used.

After the rags were sorted the second time they were delivered to the cutting machine, where they were fed into a hopper placed over a cylinder with cutting knives which cut them into pieces from 1 to 2 inches square. Then they were carried through another duster to a conveying belt which delivered them to the rotary cooking boilers, which were suspended from the ceiling below.

3. RAG COOKING

To the boilers, which had a capacity for about 10,000 pounds of cut rags, a solution of soda ash and lime was added. The rags were dropped into the boiler through a trap door in the floor of the room above; the boiler was closed, live steam admitted, and the boiler was then revolved slowly from 8 to 12 hours, depending on the grade of rags in the bleach. This process loosened the dirt and colors.

4. RAG WASHING

When the cooking was completed, the boilers were opened and the stock was loaded into small dump cars and pushed to the washing machines, where they were dumped. Water and chlorine bleaching liquor, measured by automatic recorder, were added. A continuous circulation of the contents of the washers was caused by a slowly revolving roll covered with a fine wire screening; the dirty water passed out through one side and clean water was admitted in a continuous flow on the other. After the stock was bleached, it was thoroughly washed, so that all traces of the bleaching liquor were removed. The form of report used in the washing room (Form 2, next page) like the Rag Room Report, recorded both labor expended and materials used.

5. DRAINERS AND STOCK DIGGING

When the stock was clean, it was dumped into the drainers in the basement through trap doors in the floors of the washers. These drainers had perforated tile floors so that as the stock was dumped into the drainers the water tended to drain out through the tile. A problem arose in the drainers because the top stuff dried out while the bottom stuff stayed wet; in digging it out, therefore, part was taken from the top and part from the bottom, so that the total stock taken would be neither too dry nor too wet. This stuff was dug out from the drainers as required by the furnish or beater orders, placed in dump cars, and furnished to the beaters.

6. PAPER PULPING

A pulping operation was necessary to convert both the mill broke (waste) and purchased paper shavings into suitable condition to be used with other materials in furnishing the beaters. The pulper used for converting purchased paper shavings had a dusting attachment. The shavings were received in large bales; when the bales were broken open, the contents were deposited on the wire screen of the duster, where they were sorted before passing through the pulper.

The pulping machine contained a heavy shaft from 6 to 8

WASHER REPORT FOR 24 HOURS OF 192

Bleach No.	Rags		Bleach Gallons	Into Drainer No.	Washers				Time Report					
	Cars	Kind			No.	Time On	Time Off	Condition	Name	Occupation	Bleach Hours		Other Work Hours	Total Hours
											No. 1	No. 2		

Waldron Paper Co. No. 3

FORM 2.

feet long, with iron teeth encased in an iron cylinder. The broke and shavings were fed into a hopper at the head, together with a constant flow of water. The water passed off through pipes at the other end, and the stock fell into cars.

When half stuff came to be dug from the drainers for making furnish, a problem arose from the varying moisture in the half stuff; the top materials would be dried out somewhat, but the bottom very wet. Since it was necessary to cost the various quantities taken out from these drainers, some way had to be found of allowing for this point. The Waldron Company, like many others, had formerly used a centrifugal test, in which samples of the half stock were revolved rapidly for a given period to see how much weight they lost. This method had not proved very reliable, however, and they were now trying to meet the difficulty by cutting stock from the drainers in sections which gave them a reasonable assortment in any one furnish.

A Daily Pulper Report is shown as Form 3.

DAILY PULPER REPORT

Name

Date

Hours Worked

Lot	From	Number of Bales	Pounds	Start	Stop	Hours Run	Number of Cars	Remarks

Waldron Paper Co. No. 3

FORM 3.

7. SIZE MAKING

The operations in the alum, size, and glue mixing departments converted sizing material into liquid form for use in the beaters and paper machines.

Raw rosin was received in barrels of about 400 pounds net weight and was converted into a thick liquid by cooking. In preparing a cook, 7 barrels of rosin were dumped into the cooking tank, together with 2 large bags containing 300 pounds each of soda ash. A sufficient amount of hot water was added, and then live steam was admitted for the cooking process which required from 6 to 8 hours. The liquid was then drawn off into storage tanks and pumped to smaller tanks, from which it was piped to the beaters. Records of quantities used were obtained from automatic recorders.

Three bags, each containing 200 pounds of dry alum, were mixed with the required amount of water to obtain a liquid solution of prescribed strength. After the solution had been allowed to remain in the mixing tank for a definite length of time, it was drawn off into a storage tank from which it was used in the beater furnishes as required. Similar processes were followed in the preparation of Hercules gum, top-sizing starch, and a mixture of Hercules gum and dextrine.

HALF STUFF COST SHEET

All the information presented on the daily reports for the operations described was summarized and presented on a cost report known as a Half Stuff Cost Sheet (Form 4).

These cost sheets were arranged with debit and credit columns and were handled the same as any ledger sheets. One sheet was used for each bleach and credited with all materials coming out; they were summarized and the totals posted to ledger accounts as each bleach was completed and dumped. At the end of a period only such bleaches as were finished were posted, the unfinished bleaches being taken over into the next period.

The charges for baled rags to these cost sheets were obtained from the Rag Room Reports in which the baled rags opened for bleaches had been priced and extended. All rags opened in connection with a bleach, whether actually cooked, or sorted and put in the bins, were included in the charges to that bleach; rags put in the bins, as shown on the Rag Room Reports, were summarized by kinds as Outthrows, and the weight of each kind was extended at an average market price for such rags. These extensions were then entered as credits on the cost sheet and as debits on the proper Rags-in-Bins Inventory Cards.

HALF STUFF COST Acct. No. W-14

Date Grade Bleach No.

Rag Room and Cooking		Price or Rate	Quantity	Amount		✓
				Debit	Credit	
Rag Stock	Lot Number					
No. 1 Grade No. 2 Grade No. 3 Grade No. 4 Grade						
Total baled weight						
Special Sacking Muss Dust Woolens						
Total outthrows						
Dressed weight						
Shavings						
Lime Soda ash						
Raw stock handling and storage Rag preparation Rag cooking Paper pulping Rag room labor			Hours			
Washing						
Bleach Alum Washing Drainers and stock digging Shrinkage % dressed weight Half stuff to drainers						
Total						

Waldron Paper Co. No. 3

FORM 4.

These Half Stuff Cost Sheets were also debited with all shavings used, with chemicals used in connection with cooking and washing, with burden charges for raw stock handling and storage, rag preparation, rag cooking, paper pulping, washing, and drainers and stock digging, and with any direct rag room labor. The quantities for these various items were collected from the Rag Room Reports, the Daily Washer Reports, and the Daily Pulper Reports, all of which have been described. All material was credited in detail on the proper inventory cards and debited on the cost sheets. The burden figures were obtained by extending the various weights, hours, and so forth, at predetermined rates. Direct rag room labor was obtained from the Rag Room Reports where it was first extended.

The balance remaining on these cost sheets after the above debits and credits had been posted represented the net cost of the resulting half stuff; the cost sheets were credited and the proper Half Stuff Inventory Cards debited with the net pounds at the net cost. This final entry on the cost sheets closed them out, but they were kept until the end of the period, when they were summarized by journal entry.

As only the cost of completed bleaches was figured in any period there were no balances on the Half Stuff Cost Sheets at the end of the period and therefore the balance in Rags in Process when the books were closed represented only rags in bins as shown in detail by the inventory costs.

Is there any particular advantage in summarizing all the information gathered in Rag Preparation and Conversion Process upon the Half Stuff Cost Sheet over posting directly from the individual operation reports?

What information would be wanted on the Rag Cooking and Stock Digging and Draining operations? If a report for such information is necessary draw up a form of report.

At what price should the outthrows in the Rag Preparation Department be credited to the Rag Inventory; what disposition should be made of the dirt and dust weight found at the thrasher and cooker?

State precisely from what sources the various items in the Half Stuff Cost Sheet are filled in.

4. Waldron Paper Company—No. 4

OPERATIONS AND DEPARTMENTAL REPORTS: WHAT REPORTS ARE NECESSARY FOR THE OPERATIONS IN THE PAPER-MAKING PROCESS?

In the paper-making process there were three different operations, namely, beating and refining, paper-making on the paper machine, and loft drying. The beater department of the Waldron Paper Company contained 25 beaters and 10 Jordan engines, arranged so that each combination of 5 beaters and 2 Jordan engines formed a line furnishing stock to one of the 5 paper machines. The beaters were large wooden oblong tanks, with semicircular ends, having a capacity of about 1,500 pounds air dry fiber. When a lot of paper was to be made on one of the paper machines, the beaters in the line were furnished with the required amount of half stuff and other materials, water was added, and the contents circulated around the mid-feather or partition in the center, each time passing between the beater bed and plate and the beater roll. As the roll revolved, the stock was beaten and reduced to the required condition; different grades of stock requiring different beating times. Time was allowed between the filling and dumping of beaters to insure a continuous supply of the stock after the run was started on the paper machine. During the beating operations alum and rosin sizing were added, and in making colored papers, particularly deep shades, the color was usually included with the other raw materials when the beater was filled. All coloring materials were furnished the beaters in liquid form, except in the case of dark colors. The form of Daily Beater Report used is given as Form 5, page 62. It shows the number of cars taken from the various drainers to make up the furnish.

In case a beater order extended over the end of a period the quantities in each period were summarized separately. These quantities of half stuff were credited to the Half Stuff Inventory cards, and entered as charges on the Furnish Cost Sheets (Form 6, pages 63, 64) at the average prices prevailing on the Inventory cards.

The Furnish Cost Sheets accounted for the paper in process from the time it was furnished to the beaters until it was run on to the paper machines; one of these sheets was kept for each

BEATER REPORT

Grade
Date Started
Lot Nos. to Incl.

Beater Order No.
Date Finished
Machine No.

Beaters No.																	
Furnish		Cars	Drainers	Cars	Drainers	Cars	Drainers		Drainers	Cars	Drainers	Cars	Drainers	Cars	Drainers	Cars	Drainers
Rags																	
Sulphite Pulp																	
Soda Pulp																	
Shavings																	
Filler Starch																	
Glue Alum Size																	
Color																	
Furnished Emptied Time																	
Tour: Red Green Blue																	
Remarks																	

Waldron Paper Co. No. 4

FORM 5.

furnish or beater order. In case such an order extended over the end of the period, the figures for each period were kept separately.

These cost sheets were debited with the various grades of half stuff, pulp, raw rags, chemicals, fillers, and size from the Beater Report, with burden charges for raw stock handling and storage in connection with the pulp and filler, for size making in connection with the size used, and also for the paper machines in

FURNISH COST

Date Grade Beater Order

Color Machine No.

No. of Beaters For Lot Nos. to Incl.

Fibre Stock	Amount Debit								
	Period			Period			Total		✓
	Price	Weight	Amount	Price	Weight	Amount	Weight	Amount	
No. 1 Hard									
No. 2 Hard									
No. 1 Cotton									
No. 2 Cotton									
No. 3 Cotton									
Vellum									
White Shavings									
Colored Shavings									
Raw Rags									
Raw Stock Handling and Storage									
Sulphite									
Sulphite									
Sulphite									
Soda Pulp									
Soda Pulp									
Filler									
Total Beater Weight									
Starch									
Glue									
Rosin Size									
Alum									
Colors									
Machine		Hours							
Size Making		Pounds							
Loss in Weight over Machine									
Loft Weight %									

Waldron Paper Co. No. 4

FORM 6.—Front.

RECORD OF LOTS MADE

Lot No.	Weight	Size	Watermark	Amount Credit			
				Period		Period	
				Weight	Amount	Weight	Amount
Total by Periods							
Total Credit							

Waldron Paper Co. No. 4

Form 6.—Back.

case any preliminary running had to be done, or in case the machine had to be run after a furnish to wash up. On the back of each Furnish Cost Sheet was entered the weight of all the lots made from that furnish; information for these entries was summarized from the loft book or reports. To the weight as indicated on the loft report was added 2%, or whatever proportion of loft weight experience showed would represent the machine broke not used up in the beaters during the run.

If all the paper came through within one period so that the total loft weight could be obtained to divide into the total furnish cost, then the unit price thus determined was used to extend individual lot weights for credits. If, on the other hand, all of the paper for the order had not come through at the end of the period, the lot weights were extended at an average price for that kind and grade of product. During the next period, when the order was completed, the remaining lots were credited at a price to close out the Cost Sheet.

After the stock had been beaten sufficiently, a trap in the floor of the beater allowed it to wash down into a beater chest in the basement. From this, it was pumped to the Jordan engine or refiner, where it was cut to the required degree of fineness, and then into the machine chest, which served as a reserve for the paper machine; as needed, the stock was pumped from here into the stuff box at the head of the paper machine.

8–12. PAPER MACHINES

The Waldron Paper Mill was equipped with five Fourdrinier paper machines:

No. 1	width	115	inches
No. 2	"	115	"
No. 3	"	115	"
No. 4	"	99	"
No. 5	"	99	"

Machines Nos. 2, 3, and 5 had layboy attachments for piling damp sheets of paper to be loft-dried; machine-dried and machine-finished papers were made on machines Nos. 1 and 4. Each machine was considered as a separate production center or department.

When a run of paper was started on a machine, the stock flowed through a gate in the stuff box, passing through traps and screens, which removed all dirt and other foreign matter, to the machine wire, where the actual formation of paper took place. This machine wire was an endless belt supported on small tube rolls. The flow of stock and water was controlled by the speed of the wire, the weight and thickness of the sheet being determined by means of the adjustable gate of the stuff box. The water gradually drained through the wire as the thin web moved over the rolls. At the point where the sheet of paper became entirely formed, there being no longer sufficient water to permit agitation of the fibers, the paper ran under a cylinder called the dandy roll, where, if desired, it was water marked. As the sheet left the wire, it passed to an endless woolen felt running over the press rolls where more water was squeezed out, and then was carried by an endless cotton dryer felt over a nest of about 25 steam-heated cylinders or drums. If the paper was to be machine finished, the web, as it left the last dryers, was passed through the machine calender located at the end of the dryers. The calender stack was a number of chilled steel rolls assembled one above the other; the pressure of the rolls as the paper passed between them, gave the required finish. As the paper left the calender stack, it was rolled on reels, taken off, and weighed; the known weight of the reels was subtracted to find the net weight. If the paper was to be supercalendered, the reels were run through the slitters, to be cut into required widths, and wound on cores. Paper to be shipped in rolls went through much the same operation on rewinders. Paper machines on which tub-sized, machine-dried papers were made had two nests of drying cylinders, between which the sizing tub was located. A Machine Report is given as Form 7.

MACHINE REPORT

Date Machine No. Tour

Lot No.	Weight	Size	Grade	Color	Water-mark	Start	Stop	Hours Run	Speed	Pounds per Hour	Pounds Made	Pounds Broke

Hours Run Hours Down Total Hours

Hours Down for:
Washups
Repairs
Extra Repairs

Remarks

Machine Tender

Waldron Paper Co. No. 4

FORM 7.

At the time this report was made up, another report known as the Lot Cost Sheet (Form 8) was begun.

The Lot Cost Sheets covered the paper in process from the time it was on the machines until it was finally accounted for in the form of finished stock and shavings.

The lot weights were debited, at the price and amount credited on the back of the Furnish Cost Sheets, to the individual Lot Cost Sheets under the item Furnish Cost. From this weight was figured the amount of tub or top size used, based on a

	LOT COST	Acct. No.
Date	Machine No.	Lot No.
Beater Order No.	Grade	Color
Weight	Watermark	

	Amount Debit								
	Period			Period			Total Debit		✓
	Price	Weight	Amount	Price	Weight	Amount	Weight	Amount	
Furnish Cost									
Top Size									
Size Making									
Machine		Hours			Hours		Hours		
Machine									
Loft Drying									
Calender Labor									
Calender									
Pasting		Hours			Hours		Hours		
Plating									
Plating Labor									
Sorting Labor									
Sorting and Counting									
Trimming		Hours			Hours		Hours		
Wrapping and Sealing		Hours			Hours		Hours		
Finished Stock and Storage									
Total Debits									
	Amount Credit								
	Price	Weight	Amount	Price	Weight	Amount	Weight	Amount	
Perfects—Full									
Perfects—Half									
M's									
Brokens									
Finishing Room Shavings									
Total 100%									
Machine Broke									
Total Credits									

Waldron Paper Co. No. 4

Form 8.—Front.

SUMMARY OF DAILY REPORTS

Machine				Calendering				Pasting				Plating				Sorting			
Date	Hours	Pounds	Pounds Broke	Date	Hours	Quantity	Amount	Date	Hours	Quantity	Amount	Date	Hours	Quantity	Amount	Date	Hours	Quantity	Amount

Trimming				Wrapping—Sealing				Perfects—Full			Perfects—Half			M's			Brokens		
Date	Hours	Quantity	Amount	Date	Hours	Quantity	Amount	Date	Reams	Pounds	Date	Reams	Pounds	Date	Reams	Pounds	Date	Reams	Pounds

Waldron Paper Co. No. 4

Form 8.—Back.

schedule of absorption determined by experiments. The burden charge for size making was figured from the weight of top size, while that part of the machine burden which was computed on tonnage was figured from the lot weight. From the quantity of paper finished the finished stock storage and shipping burden was figured and entered. The M's and brokens were extended and credited at a reasonable market price; the perfects were credited at actual cost, the entries for which close out the money columns.

It was impossible to determine by individual lots the item of shavings, which was taken at whatever weight was necessary to close out the lot after all the perfects, M's, and brokens had been entered. Shavings arose at two points; there was first the machine broke not used up in the beaters during the run. Since the broke for each lot was not weighed separately, a flat rate of 2% was applied to the loft weight to obtain an estimated weight of this material. The other part of the shaving item, the finishing room shavings, was figured as the difference between the corrected loft weight of the lot which entered the finishing room, and the sum of the weights of perfects, M's, and brokens after finishing. The shaving items were not figured until the end of the lot when they were extended at a reasonable market price. All shavings determined on these lots were debited in detail to the shavings suspense inventory cards. The total weight of perfects, M's, brokens, and finishing room shavings were each figured out as a percentage of the total loft weight for statistical purposes. At the end of the period summarizing journal entries were made covering all the entries on the Lot Cost sheets for the period.

In the paper-making process, broke, which was the technical name for waste resulting from breaks in the web of paper as it ran over the machine, occurred mostly at the dry end; since the paper machines ran continuously, a certain amount of unusable material was piled up before the break could be remedied. In the Waldron Paper Company mill, broke was weighed and recorded daily; but no record was kept of how much came from each run or lot. This broke was disintegrated and returned to the beaters which sometimes allowed some of it to come through with the same run, but much of it was used for different runs of paper. Moreover, there was a certain amount of invisible waste in conversion, due to fine particles running away with the waste water, this amounting on the average to 7% of the furnish weight.

The foregoing descriptions of the paper machine operations applied to the making of machine-dried and machine-finished papers. The paper machine operations for making loft-dried papers were similar to those described, with the exception that after the first drying and tub-sizing operations, the paper passed to the layboy without a second drying. The operation of the layboy consisted of cutting the large web of paper into smaller sheets, which fell over revolving rolls and were picked off by narrow wooden arms on a continuous belt, laying the sheet on large skeleton trucks placed near the layboy. The air-dry weight of each load was computed and recorded.

Orders were often received and accepted for loft-dried paper which it was not practical or economical to make and cut on the layboys of machines Nos. 2, 3, and 5; they were usually made on one of the other machines then available. As a result, those orders for loft-dried paper were first machine-dried; the large reels of paper were then transferred to an auxiliary machine where they were sized and cut into smaller sheets, the same as on the layboys of machines Nos. 2, 3, and 5.

13. LOFT DRYING AND JOGGING

The dry lofts were located on the second floor; the loads of paper were moved up there, and the sheets hung over adjustable poles set about 8 feet from the floor. By raising the temperature to about 120 degrees and replacing the moist air with fresh air, the moisture was gradually absorbed from the paper. The room remained closed from 15 to 36 hours, according to the quality and grade of paper. In order that the finishing processes might be performed satisfactorily a definite per cent of moisture was allowed to remain in the papers. After this seasoning process, the sheets were loaded on platforms, weighed, and removed to the jogging rooms.

Loft jogging was the first operation on loft-dried paper which was to be plated. The drying operation in the dry lofts gave the sheets a tendency to warp and wrinkle on the edges. When the paper was taken to the lofts, it was usually piled irregularly on the trucks and many corners were turned in. In the loft-jogging operation a worker took a suitable number of sheets from the load or pile, and jogged or jolted the sheets on the table until the edges became even and regular. He picked out the turned corners, and laid the jogged sheets on trucks or skids.

Why could the five paper machines not be treated as one department?

How could the waste lost through fine particles running away in the water be accounted for?

What relationship, if any, is there between the Beater Report in this problem and the Half Stuff Cost sheet given in the Waldron Paper Company No. 2 problem?

Just how do the Half Stuff Cost sheet, the Furnish Cost sheet, and the Lot Cost sheet function in the cost accounting scheme of the Waldron Paper Company?

5. Waldron Paper Company—No. 5

OPERATIONS AND DEPARTMENTAL REPORTS: WHAT OPERATIONS AND REPORTS ARE NECESSARY IN THE PAPER FINISHING PROCESS?

The Waldron Paper Company applied numerous kinds of finish to the surface of the rough paper, such as machine finish, supercalender finish, and plater finish; several kinds of finish might be had under each of these heads. The kind of finish made on the supercalenders and paper machine calenders was determined by the number of rolls of the calender stack through which the paper was allowed to pass. Papers were routed through the finishing departments according to the type of finish specified on the order.

Frequently, machine-dried and machine-finished papers were wrapped in rolls and shipped as they came off the paper machines. Loft-dried papers were sometimes wrapped in bundles and shipped without further processing; or they might be routed through the sheet calendering, sorting and counting, and shipping operations without passing through the trimming and wrapping operations.

14. SUPERCALENDERING AND HOT ROOMS

The supercalender operation gave the paper a higher finish than was possible on the machine calender stack. The rolls of paper to be supercalendered were moved from the machine room, or storage place, by the men operating the supercalenders, and there raised and supported on stands which allowed them to revolve during the operation. The web of paper passed between the necessary number of rolls to secure the required finish, and was again wound into rolls on the opposite side of the calender. A Daily Calender Time Card is shown as Form 9. The supercalendering and hot rooms were closed from 12 to 15 hours, permitting the pasting solution to dry in an even temperature. When dry, the paper was given to women who weighed it and separated any sheets that adhered together.

DAILY CALENDER TIME CARD

Name

Date

Hours Worked

Lot No.	Size	Weight	Way Through	Times Through	Pounds	Pay by the Day	Reams Run	Rate	Amount	Remarks

Waldron Paper Co. No. 5

Form 9.

15. PASTING AND RULING

In the pasting and ruling room, supplementary operations were performed on customers' orders in process, or on orders being filled from the stock house.

Card stock was made by pasting two or more sheets together in the pasting machine, an oblong wooden tank with table and roll attachment at each end. The paper to be pasted was placed on fine endless cords that traveled on the rolls, conveying the sheets through rolls which pasted and pressed them together. When the required number had been processed, they were placed in a press and allowed to remain under heavy pressure for a short time, after which they were removed and trucked to the drying rooms.

The ruling machines were set up by the foreman but were operated by women; they were practically alike in size and construction. A Daily Pasting Room Report is given as Form 10.

<table>
<tr><td colspan="10">DAILY PASTING ROOM REPORT
Date</td></tr>
<tr><td rowspan="2">Lot No.</td><td rowspan="2">Size</td><td rowspan="2">Weight</td><td rowspan="2">Dampening or Pasting</td><td rowspan="2">Pounds</td><td rowspan="2">√</td><td rowspan="2">Machine Hours</td><td colspan="3">Time</td></tr>
<tr><td>Regular</td><td>Over</td><td>Name</td></tr>
<tr><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td rowspan="5"></td><td rowspan="5"></td><td rowspan="5"></td></tr>
<tr><td colspan="2">Materials Used</td><td>Starch</td><td>Glue</td><td>String</td><td colspan="2">Gloves</td></tr>
<tr><td colspan="2">Kind</td><td></td><td></td><td></td><td colspan="2"></td></tr>
<tr><td colspan="2">Quantity</td><td></td><td></td><td></td><td colspan="2"></td></tr>
<tr><td colspan="2"></td><td></td><td></td><td></td><td colspan="2"></td></tr>
</table>

Waldron Paper Co. No. 5

FORM 10.

16. PLATING

The paper to be plated, which might be either machine- or loft-dried, was moved from the storage places by workmen and placed on tables beside the plater machine. The sheet plater girls worked in groups of three; they built up forms taken from so-called plater stores, consisting of paper boards and sheets of linen cloth, zinc, and iron, with sheets of paper interleaved. When a form was completed the plater man moved it on to a swing table which turned to position in front of the plater. After the forms had passed forward and backward between the plater rolls, they were moved back to the swing table, where the plater girls took the forms apart, removed the paper, and built up a new form for the same process. After weighing them, workmen took the piles of plated paper away. As many as 12 girls might be engaged on a single plater, and 24 on a double plater. Only one man was required for a single plater. When the sheets of zinc and iron became useless, they were transferred to general stores and classed as scrap; the linen sheets were sent to the rag room for bleaching into half stuff. A copy of the Daily Plater Time Card is given as Form 11.

DAILY PLATER TIME CARD

Date No. Plater

Hours Worked

Lot No.	Size	Weight	Pounds	Time	Finish	Reams Run	Rate	Amount	No. Girls	Amount
					Linen, etc.					

Waldron Paper Co. No. 5

Form 11.

17. SORTING

The sorting operation was performed by women seated at long tables, upon which the paper to be sorted was placed by workmen so that the sheets might be inspected singly for poor finish, dirt, wrinkles, and other imperfections. The poorer and medium grades of paper were sorted into two boxes for two classes, and the higher grades into brokens, perfects (P's) and mediums

(M's); the latter two required a second inspection called overlooking. The lower grades frequently received only the overlooking operation, or possibly were sorted on the rotary cutters. The mediums and brokens on most paper did not exceed 3% of the total, of which the brokens composed less than 1%. The paper was then weighed by grades and moved to the next operation.

Paper was counted by women into reams of 500 sheets, each ream being indicated by a marker. A Daily Sorting Time Card is given as Form 12.

DAILY SORTING TIME CARD

Date Hours Worked

Lot No.	Size	Weight	No. Boxes	Grade	Pounds	Item No.	Day Work	Reams Run	Rate	Amount	Remarks

Waldron Paper Co. No. 5

FORM 12.

18. TRIMMING

Specifications on the manufacturing instructions included two sizes, size to make and size of finished paper, the latter being after trimming. Provisions were made for a margin on one or more sides of the sheet. The trimmers cut the sheets to the exact finished size, and the paper was then weighed again. The paper shavings trimmed off were weighed, recorded, and dumped into the shaving bins, but without keeping track of the shavings from the individual lots, because of the extra detail such a procedure would require. Though most of the shavings and other wastes of paper came from this process, there was some waste in all the finishing departments; this other waste was handled in a similar manner. A Daily Trimmer Report is presented in Form 13, one being used daily for each trimmer.

DAILY TRIMMER REPORT

Date Name

Lot No.	Weight	Size	Water-mark	Color	Reams P	Reams M	Reams Brokens	Brokens Cut Up	Brokens Split Up

Shavings	Start	Stop	Hours	Pounds P	Pounds M	Pounds Brokens	Remarks

Waldron Paper Co. No. 5

Form 13.

19. WRAPPING AND LABELING

The wrapping was done by men working at tables. The paper, as delivered, was subdivided into reams, half-reams or quarter-reams, and each subdivision of the paper was wrapped in a single wrapper and secured with strips of strong paper sealing tape. The labeling of the packages was done by girls, who also stenciled or stamped a proper description on each package.

Paper to be shipped in rolls was usually wrapped and sealed in heavy linings with the ends protected by narrow pieces of wood, set into place before the rolls were wrapped. After this process the rolls were moved to the weighing scales, where each roll was weighed and marked. Wooden frames were used for packing "semifinished" or "finished paper" shipped in bundles.

When sheet paper was ready for packing, cases were brought to the packing room where the gross weight was marked on each case. They were lined with waterproof case lining, and paper was packed into the cases either loose or in sealed packages. After covers and corners were nailed on, the cases were moved to weighing scales where the gross and net weights were recorded; the cases were then marked or directed, and moved to the stock house or loading platform. Paper packed in cases and placed in the stock house was usually made on customers' orders and billed when finished. The Daily Sealing Report is not given since it is very similar to the Daily Trimming Report.

20. FINISHED STOCK STORAGE AND SHIPPING

In the stock house, a motor tiering machine was used for handling and piling the cases of paper as they were received, while wrapped and sealed paper was arranged by hand. Orders filled directly from stock were packed by the stock house crew and delivered to the loading platform. When orders were received for shipment of a customer's "bill and hold" paper, written instructions were issued to the stock house clerk.

What forms would be necessary, if any, to gather information pertaining to loft jogging, wrapping and labeling, and finished stock storage and shipping?

At what times would you say the information contained in this problem would be summarized on the Lot Cost Sheet given in the Waldron Paper Company No. 4 problem?

Do you think it is necessary to have the daily reports throughout the operations of the three paper-making processes such as the Waldron Paper Company has been using? If not, what would you suggest in their place as the method of accumulating the various costs?

6. Becker Designs Company

PRODUCTION CONTROL: HOW MAY PRODUCTION BE BUDGETED AND SCHEDULED IN AN ART DESIGNING AND PRINTING PLANT?

The Becker Designs Company did a considerable business in artistic greeting cards, including regular lines sold all the year round, and holiday cards for the Easter, Valentine, and Christmas seasons. The company did some of its own designing and purchased others which were submitted to it. In manufacturing, some of the products were die-stamped and others only printed. The business was highly seasonal and at peak-load periods considerable quantities of work were sent out to be produced in near-by factories. The problem of budgeting and scheduling production was, therefore, one of considerable importance; a successful handling of the problem meant that less work would have to be sent out and that the net profits of the company would be higher than otherwise. It was not felt that the best results had yet been obtained in this direction, and one of the plant officials was deputed to study the situation. In his report he specified the following objectives to be borne in mind by a satisfactory plan:

1. Each seasonal item should be produced in sufficient quantity to enable all orders received for it to be filled.
2. In accomplishing this it was desirable to avoid excess production on seasonal lines which would probably have to be written off as dead loss.
3. A sufficient quantity of the various items in the regular line should be produced and boxed in time to be shipped on the normal run of orders.
4. Production orders both for printing and for die-stamping should be for quantities large enough to constitute economical runs, in view of the initial costs in making ready.
5. The total production assigned to the company's own plant should be so scheduled as to constitute regular production and to avoid extreme peaks and valleys, the object being to utilize the company's own equipment to the fullest possible extent.
6. In conjunction with the preceding item it was hoped to eliminate overtime work as far as possible, since this was found to contribute to unsatisfactory work.
7. It was believed possible to stop production on some lines at a semifinished stage, in order to reduce the number of finished items on which separate inventory had to be carried; at the same time a complete line of finished items had to be maintained in stock.
8. A dispatch system in the different shops should facilitate the orders to individual machines and workers with the least possible loss of time, and yet maintain inventories in process at the lowest possible point.

The program embodied in the preceding eight points was recognized as a somewhat difficult one to accomplish, but its importance made it necessary to advance as far as possible in the direction indicated.

PRODUCTION BUDGET

It was believed that the initial stages of production control were to be found with the committee which determined the number of new items which were to be added to the various lines from time to time. This committee was headed by the vice-president in charge of sales, and it was proposed that, in making their general plans, the committee should be supplied with statistics of sales for the different lines, subdivided by items, in the preceding season; it was expected that this would furnish guidance as to the types of items which seemed to be most in demand. It was proposed by the officer in charge of the study that when the committee had completed its plans for the new lines they should prepare an estimate of the probable sales, by lots and by items, of the numbers they had approved. When it was argued that this involved some difficulties the answer was made that the very act of adopting an item required an estimate on the part of the committee that it would sell at least beyond a certain minimum quantity; it was believed, therefore, that if such estimates could be prepared to check up with actual figures of past sales with a minimum degree of improbability, the purpose in mind would be met; this was to prepare in advance a calendar of production with a view to distributing the manufacture of all lines throughout the year with the most uniform flow from month to month. In other words, a production budget was to be prepared. The following statistical information was available:

1. Orders received, in quantities, subdivided into price groups and different lines.
2. Orders received expressed in dollars for each line.
3. Shipments by lines, expressed in money.

It was suggested that the best beginning for a production budget would be to schedule the quantity of regular items month by month; since these were the lines least affected by seasonal movements it was probable that they would respond most easily to scheduling. Next the holiday lines could be taken, Easter, Valentine, and Christmas separately, and each distributed by monthly quotas over a period beginning with the earliest date on which it was practicable to begin production on that particular line. It was hoped to schedule this part of the production so that approximately one-twelfth of the annual amount would be assigned to each month. Since these quantities were to be handled only as general totals it was felt that they could be well expressed in units of the sales dollar for purposes of assigning them to different months; breaking down the dollar total by lines or items could be sufficiently dealt with when subdividing the total for each month. These plans would tend to make it possible to schedule production, with special reference to the quantities which should be assigned to outside plants.

SCHEDULING

It had been the custom in the past to defer the scheduling of manufacturing orders until customers' orders for one or two months had been tabulated. It was proposed that this same tabulation could under the new plan be used as a check upon the production budget as already described. As a result a revised production budget could be set up, in which the original figures had been changed for those lines where actual sales differed materially from the original estimates. This revised production budget would thus furnish the basis for scheduling orders by days and weeks. To facilitate this, Form 1 was proposed as an Order Control Sheet on which would be listed, by main classes of product, the different orders to be scheduled daily.

Actual production orders consisted of a general order describing the product required, enclosed in an instruction envelope, which contained detailed information on its face. In connection with each such order a series of work tickets for the different departments, such as printing ticket, stamping ticket, and bordering ticket was made out. Each of these tickets was prepared in coupon form, with one coupon for each operation to be performed within the department indicated on the ticket. The total of Form 1 would give at all times the sales value of the production covered by the number of sheets included; since these orders were also analyzed by machine-hours it would readily be shown whether the total volume of work so scheduled was

PRODUCTION CONTROL

PRINTING AND DIE STAMPING

Order Control Sheet — Printing — Rust Craft

Daily List of Orders Scheduled — Date____________19___ — Die Stamping — Outside

Order No.	Quantity	Date Wanted	Card Nos.	Press Hours						Stamp Hours				Sales Value				Date Completed		
				Miehle	Kelly	Miller	Hand Feed	Bronze	Bake	Large	Medium	Small	Hand	Cards or Folders	Blanks	Inserts	Tukkins	Part	All	
Date																				
Total Scheduled Today																				
Balance Uncompleted																				
Balance Uncompleted																				
Balance Uncompleted																				
Balance Uncompleted																				
Balance Uncompleted																				
Balance Uncompleted																				

Becher Designs Co.

FORM 1.

within the capacity of the departments to which it was assigned. From these totals it could be seen how the entire production of the season was scheduled.

What would be the probable effect of this procedure on the costs of production?

What relation would these records for budget and scheduling purposes bear to the work of the cost department?

C. SALES DEPARTMENT AND PRODUCTION COSTS

1. Harlem Manufacturing Company

PRICING: WHAT RELATION SHOULD EXIST BETWEEN MARKET PRICES AND INTER-PLANT TRANSFER PRICES ON THE SAME KIND OF MATERIAL?

The Harlem Company was a manufacturing concern, operating two types of plants, namely, primary plants which produced the finished products turned out by the company, and secondary plants which produced fabricated parts, such as, wire, wire cloth, wire belts, wire springs, sheet metals, perforated metals, chain links, and other materials, which were used to manufacture the finished products. One of the primary plants was located at Clinton, Massachusetts, and one of the secondary plants at Reading, Massachusetts; the other plants were located at strategic points in the country.

The accounting work for all of these plants was centralized in the company's main office, where approximately 450 people were employed; this office was located in Boston. The various manufacturing plants regularly sent in reports on their operations to the main office, where the information was summarized from the reports and entered in the books of account.

On one occasion when the production manager of the Clinton plant mailed in his report, he complained about the conditions under which he was operating. He explained that he was receiving wire and other materials from the Reading plant and on recent invoices from that plant was being charged approximately $2 per lot more for wire than he could buy the same wire from the Clinton Wire Works, a local company. He said that since he was held responsible for the costs of his operations it was foolish for him to accept wire from the Reading plant when he could purchase the same kind of wire much more cheaply from the local plant.

Upon receipt of this letter the controller answered the production manager of the Clinton plant stating that his contention was sound and that from that date on wire would be charged to the Clinton plant at the same price that wire could be purchased from the local wire manufacturing plant. So far as the invoices received at the Clinton plant were concerned this procedure was actually followed after this exchange of correspondence.

The Reading plant, however, was never able to meet the cost of wire as quoted by the Clinton Wire Works, and the controller, in billing the wire from the Reading plant to the production manager of the Clinton plant at this competitive price, was transferring it below the cost of production to the Reading plant. So far as the head office accounting was concerned, however, this method was only a device to satisfy the Clinton production manager, for the entire cost of the wire at the Reading plant was charged against the Clinton manufacturing plant on the books of account. The production manager of this plant, obviously, had no way of knowing this and assumed that his request was being honored throughout the accounting records.

Several production managers at the various factories had, from time to time, asked to have the accounting work decentralized, contending that if each factory had its own accounting department, the production manager would have more information and be better enabled to operate efficiently the plant in which he was in charge. This request had never been granted and the accounting work had always remained centralized.

From a cost accounting and control viewpoint, what do you think of the controller's practice in this case?

Would the controller's action warrant the company's acceding to the request for decentralized accounting?

2. Tilden and Company—No. 2

SALES DEPARTMENT AND COSTS: WHAT RELATIONS EXIST BETWEEN COSTS AND SELLING PRICES AND POLICIES?

The management organization of Tilden and Company, together with criticisms thereon, was discussed in another case; the consultants, having made their recommendations with regard to the personnel of the management, proceeded to examine the general plan of the company's sales operations, and to consider whether it was effective and well coordinated with manufacturing policies and costs.

The company was one of the oldest firms in the country engaged in the manufacture of fine stationery, for which it was equipped to perform all the necessary operations of cutting, folding, and decorating various grades of correspondence sheets, envelopes, and box-tops, the making of boxes and packing them. To this work was added a certain amount of die engraving, which was developed chiefly to absorb idle capacity of the engraving department when it was not fully occupied with stationery.

The company endeavored to market its product throughout the United States, with a small export trade to Latin America. There were four full-time salesmen in addition to the sales manager, and four outside salesmen handled this line in connection with other lines; all were paid on a commission basis. Sales were made to jobbers and retailers, but no exclusive territorial rights were given. The sales were made from a list from which the salesman was authorized to allow up to 25% to a jobber or 10% to a retailer; all sales were made f.o.b. factory with an allowance for freight on sales to jobbers west of Pittsburgh. Very little price differential was allowed for quantity orders. Customers were permitted to make certain slight changes from the standard product or packing, and, in such event, it was customary to insist upon minimum orders or a small extra price. The engraving work was all handled by the assistant manager and no commission was paid thereon.

Manufacture was for customers' orders only. When new lines were brought out, sufficient samples were prepared for the use of salesmen, a description card being made out for each line at that time. A separate Manufacturing order was made out for each number ordered by each customer, each manufacturing department concerned in an order receiving a copy of it. Every foreman was responsible for combining orders as effectively as possible to secure maximum runs in his shop, but a great variety of the work, and the fact that 40% of it called for special handling, made it difficult to combine orders on a very economical basis.

NEW LINES FOR THE SEASON

The development of new styles of goods each season was an important matter, as competition made it necessary for the company to produce more and more attractive packages. The work of developing these new lines proceeded under the personal supervision of Mr. Banner, the president and sales manager. During the month of February a line of about 400 numbers was prepared for salesmen to take out in March; of these some 60% were known as "holiday numbers," the rest being staple numbers; in August about 200 numbers, all staple, were developed for offering during September; in December a few new numbers were added to this line as substitutes for those which had not sold well. Mr. Banner himself developed most of the ideas for these new lines, after consultation with salesmen for new papers, and seeing what different combinations could be made with the new materials available. The assistant manager, Mr. Atwood, worked up these ideas into definite specifications and style numbers, from which the official description (Form 1) was prepared.

A Manufacturing order was then put through for the samples, an Estimate Sheet (Form 2) being prepared at the same time. These estimates were figured on a run for 1,000 packages, and cost figures were inserted for the various parts of the package, but not by operations. Samples of the different lines were then inspected by the president and assistant manager in order to establish selling prices for them, after considering their manufacturing cost and their probable attractiveness. Where items did not seem attractive enough to justify a price which would cover the manufacturing cost, changes were made which would either improve their appearance or reduce the cost. Attention was finally given to the question as to whether the line included a satisfactory and complete assortment.

DESCRIPTION CARD

Style No. Size

Top

Envelopes			Paper		
Size	Quantity	Stock	Size	Quantity	Stock

Tint Band Tie Wrap

Tilden and Co. No. 2

Form 1.

The consultants commented upon this procedure by suggesting that more than one individual should take part in creating the original ideas for the line, in view of the variety of tastes which had to be satisfied if large sales were to be made. They proposed also that the more definite inclusion of the factory superintendent in this work might lead to the development of lines which would be cheaper to manufacture and just as attractive as those now produced. The consultants believed that the cost data on which prices were based were not very reliable since, although they purported to relate to large quantities, they were gathered in connection with the production of smaller quantities. It was also pointed out that old burden rates, which were probably inaccurate, were being used. It was further suggested that the preparation of the new line should be spread out over a longer period so that the making of samples might not interfere so much with quantity production, as now occurred. A final suggestion was that the establishment of a creative department to indulge in

ESTIMATE

Date Style No.

For

Description

Stock

	Description	Number to M Boxes	Cost per M		Extension
			Material	Labor	
Envelope					
Paper					
Card					
Box					
Top					
Assembling					
Gilding					
Carton or Wrap					
Special					

Total Mfg.

Selling Price Plus S & A

_____________ Plus Profit

Tilden and Co. No. 2

FORM 2.

regular and systematic studies of design and color values would be helpful.

SALES DEPARTMENT

The annual sales of the company were about $400,000 which, the consultants pointed out, were insufficient to yield a profit, No definite estimate was made as to precisely at what point a profit would arise, but the necessity for increased sales was strongly urged. With this in mind the work of the various salesmen was reviewed, consideration being given to the volume of business they had obtained with reference to the character of their territory. The consultants asserted that they found it difficult to determine just what the sales policy of the company was; it appeared to be:

1. To get as much business as possible and to quote any prices which would get the business.
2. To offer merchandise of high quality and push the sale of the high-priced items.
3. To allow customers to change the product, provided the changes did not cost too much.
4. To include holiday goods only in the March line.

No effort had been made (1) to organize the work of salesmen by setting quotas or offering incentives; (2) to have salesmen make suggestions; (3) to prepare sales statistics; or, (4) to create a consumer demand for their products, either by advertising or other means of sales promotion. Comment was made on the fact that the sales manager, devoting less than half his time to direct selling, made 30% of the total sales; this seemed to indicate that he was much better as a salesman than as a sales manager. The manner of conducting some of the sales offices was criticized and it was further suggested that organized sales effort be made on certain lines, so that a large volume of business might be obtained thereon which would permit factory production in quantity runs and a consequent reduction in costs. In these circumstances, the consultants suggested (1) the appointment of a sales manager who was familiar with aggressive selling methods; (2) that more direction be given from the head office to the salesmen; (3) that the present sales manager be transferred to the New York sales office where he would be more effective as a salesman; (4) that variations in product specifications be discouraged; (5) that the efforts of salesmen be supported by some program for the creation of consumer demand; (6) that salesmen be forbidden to overdraw their accounts excessively as in the past, and (7) that new and promising salesmen be introduced into the business.

Do you approve of all the suggestions here made?

Would the development of leading lines in large volume be likely to accomplish the desired purpose of reducing costs?

In what particulars was the criticism of the cost estimates well founded? Could the criticisms be met?

3. Bishop and Walters

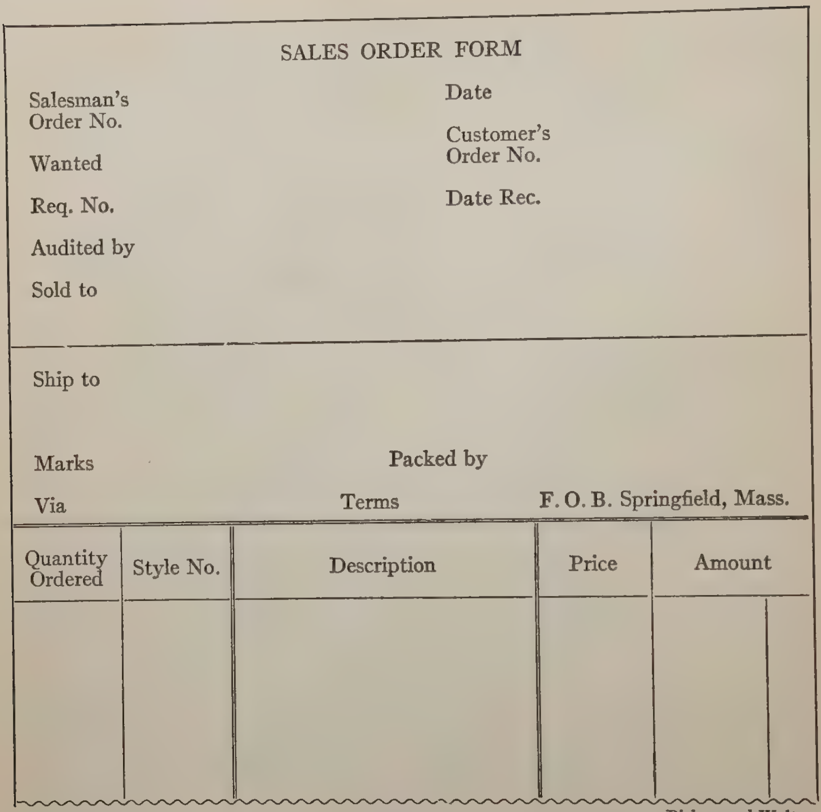
SALES AND MANUFACTURING ORDERS: HOW MAY CUSTOMERS' ORDERS BE ORGANIZED INTO MANUFACTURING ORDERS?

Bishop and Walters, manufacturers of fine stationery, secured most of their orders through traveling salesmen, who took the orders on triplicate forms (Form 1), of which one copy was sent to the company's office, a second copy retained by the salesman, and a third copy given to the customer.

Each salesman had a separate series of order numbers. Some of these orders were final, while others required confirmation from the customer before shipment could be made. Orders received at the office by mail were copied by the order clerk on the regular salesman's forms, the original order being attached to the first copy; a simple acknowledgment was sent to the customer. All orders were then registered in a simple Order Book, and the customer's credit verified; for old customers, the latter procedure consisted simply of checking the order; for new customers reference was made to *Bradstreet's,* or application was made to the Stationers Association. In all doubtful cases the approval of the sales manager or office manager was sought. Orders were then checked for prices and terms; orders received by mail were acknowledged, but not those received from salesmen. Orders were then grouped into regular; special, *i.e.,* involving some departure from standard specification for the order; label orders, for which the customer's own labels were to be affixed to the packages; and ruled orders, calling for some form of ruling.

Orders were then entered on Shipment Requisition Sheets (Form 2) after which four copies (Form 3, page 92) were made of each order, to be used respectively for the office file, shipping department, box shop, and paper department.

The order clerk then indicated, for each item on each order,



SALES ORDER FORM

Salesman's Order No.
Wanted
Req. No.
Audited by
Sold to

Date
Customer's Order No.
Date Rec.

Ship to

Marks
Packed by
Via
Terms
F. O. B. Springfield, Mass.

Quantity Ordered	Style No.	Description	Price	Amount

Bishop and Walters

Form 1.

whether it could be shipped from stock, or needed to be manufactured. A perpetual inventory of finished stock was supposed to be kept, from which the order clerk could tell at once whether the item was in stock or not; but the record had fallen into disuse and notations on orders were made by the order clerk from memory.

At this point orders were entered in a Commission Record, prepared with the following columns:

1. Date
2. Name
3. Address
4. Order Number
5. Direct Sales
6. Mail-order Sales
7. Cancellations and Returns
8. Cash Advanced
9. Commission Credited

Only definite orders were entered in this record; if subject to confirmation they were entered as confirmed. Commission was credited to salesmen at once on direct and mail-order sales, cancellations being entered in red as deductions.

SHIPPING REQUISITION

Date Entered
Sales No.
Amount
Remarks

Shipments			
Date	Amount	Date	Amount

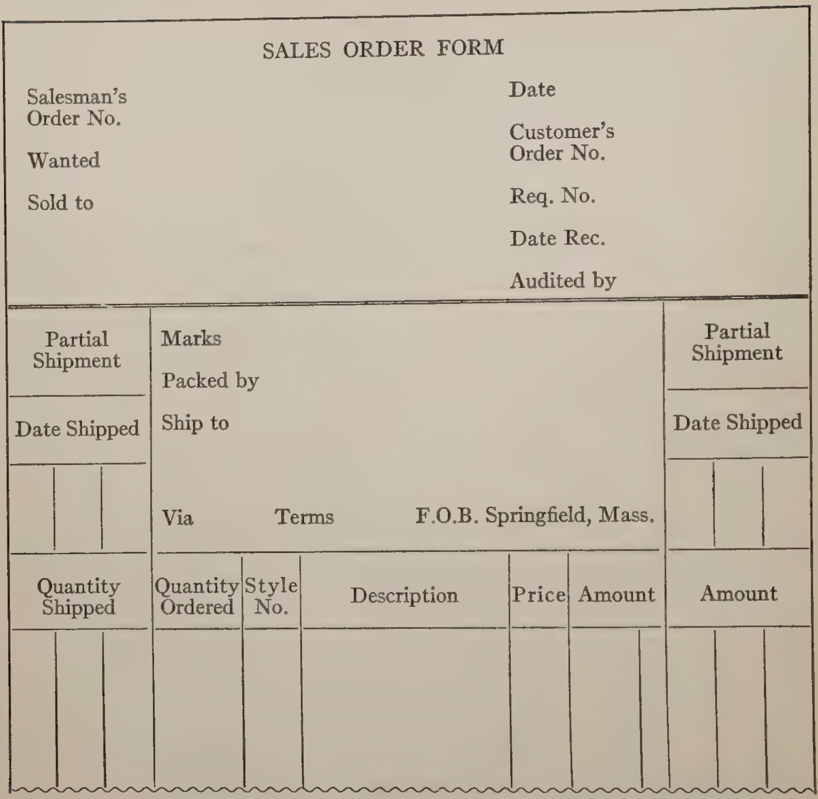
Jan.	Feb.	Mar.	Apr.	May	Jun.	Jul.	Aug.	Sep.	Oct.	Nov.	Dec.	Customer	Req. No.

Bishop and Walters

FORM 2.

Next the order was entered in a style number sales record, a card index with a card for each style number. Sales were accumulated by season, but no notation was made as to whether an order was regular or special as to specification. The sales department consulted this record from time to time, but there was no regular totaling or recapitulation of the cards.

The orders were now ready to be transcribed on Manufacturing Orders (Form 4), made up in triplicate, one copy each for the paper, envelope, and box departments; if printing were necessary, a fourth copy went to them.



SALES ORDER FORM

Salesman's Order No.
Wanted
Sold to

Date
Customer's Order No.
Req. No.
Date Rec.
Audited by

Marks
Packed by
Ship to
Via
Terms
F.O.B. Springfield, Mass.

Partial Shipment						Partial Shipment
Date Shipped						Date Shipped
Quantity Shipped	Quantity Ordered	Style No.	Description	Price	Amount	Amount

Bishop and Walters

FORM 3.

A separate manufacturing order was made out for every item which could not be shipped from stock; in addition to the usual particulars as to the order, the complete description of the item ordered was copied from the record of style description; to this any special instructions were added.

These manufacturing tickets were then passed to the head of the scheduling department, who distributed them to the various foremen. After completion of the orders, the envelope and box department filed their copies, but the paper department copy went to the shipping room, whence it was returned at once to the office. Manufacturing orders to the engraving department were accompanied by special engraving orders.

MANUFACTURING ORDER

Date	No.
Requisition No.	Style No.
Sales Order No.	Date Wanted
Quantity	Department No.
Production Order No.	Customer's Label

Boxes

Size	Depts.	Stock	Cartons
Top			

Envelopes				Paper			
Size	Quantity	Stock	Case	Size	Quantity	Stock	Die

Tint	Band	Tie	Wrap

Bishop and Walters

Form 4.

Could the procedure for the transmission of customers' orders to the factory be simplified or improved?

Was the method of crediting salesmen with commission satisfactory?

Was the handling of finished stock well coordinated with the issue of manufacturing orders?

4. Meat Packing Industry

PRODUCTION COSTS: WHAT RELATION HAS COST ACCOUNTING TO BUYING AND SELLING OPERATIONS?

The *Report of the Federal Trade Commission*[1] on the meat packing industry criticizes severely cost accounting methods used by the large packers. The following is an excerpt from this part or the report.[2]

> At the instance of the President's meat committee and of the United States Food Administration, the Commission made a survey of the possibility of introducing a uniform accounting procedure for the great packers. It was found that in order to ascertain accurate costs and profits, not only on specific products, but on the business as a whole, sweeping revisions in the accounting methods now followed by the several companies would have to be adopted.
>
> Accuracy of departmental or specific product costs turns upon the introduction of a sound cost system whereby the exact cost of the live animal can be allocated to the several departments handling different products derived from that animal, thus charging each product with a share of the original cost, instead of charging the original cost as at present to the carcass meat department, and crediting by-products thrown off from the animal, on the basis of ill-defined "market values." If transfers between departments, and the pricing of inventories can be reduced to a cost basis, the problem of accurate profit finding is largely solved.

The following statements appear in the same part of the report.[3]

> To get at the profit on beef it is necessary to secure the cost of that portion (about 55% of the live animal weight) of the steer which goes into carcass meat. Not until a cost system is evolved whereby there is an initial slaughtering department which kills the animal and transfers the various parts to other departments (such as dressed beef, hides, oleo, and so forth) in such a fashion that each department absorbs a proper share of the total live and killing cost, each bearing its proportion of waste and shrinkage, will the packers be enabled to announce with any authority their costs and profits per pound of beef produced.
>
> The departmental cost accounting theory currently followed by the packers is built on the assumption that the carcass meat of the steer is the sole main product and all material thrown off is so much by-product credited to beef on the basis of the prevailing market price, the

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[1] Part V, "Profits of the Packers." [2] *Ibid.*, pp. 13 and 14. [3] *Ibid.*, p. 77.

beef department thus carrying the initial live and killing cost of the whole animal. It is obvious that the live steer is not killed for its meat alone, but also for its hide and fats; as well, in a lesser degree for its other products. The leather industry is one of the oldest and most important, not only in the country, but in the world, and the same can be said for cattle fats. Market conditions covering these so-called by-products are important considerations in the mind of the packers' live-stock buyer when he sets the price he is willing to pay per pound for the live animal. To a lesser degree the value of other products such as bones, casings, offal, and so forth, have their place in fixing this price. The cost of beef cannot, accordingly, be assumed to be the cost of the live animal, credited with the returns from all material except carcass meat.

The following is an excerpt from "Joint Cost in the Packing Industry," an article in the *Journal of Political Economy*,[1] by George E. Putnam, of the commercial research department, Swift and Company.

. . . Under the circumstances there is only one method that the packer can follow if he is to know in what operations it is worth his while to engage. In the first place, he must deduct the value of all by-products from the total live and killing cost of the animals slaughtered in order to arrive at a cost figure for his main product. If any of his by-products are advanced to a further stage of processing, the net market value of the by-products must be taken as the initial cost in the undertaking. Such procedure would necessarily follow from the fact that the packer has one of two alternatives where his raw by-products are concerned: either he can sell them to someone in the outside trade at the current market prices, or he himself can assume the cost and risk of subjecting them to further processing.

For accounting purposes, the large packing plant is divided into a number of departments, each dealing with a specific product or a group of related products. The operating departments are to be distinguished from the service departments because the latter sell few products to the outside world. As a rule, they merely furnish the operating departments with supplies and services.

Each department records its own purchases, sales, inventories, expenses, and transfers to and from other departments, so that the net result of each operating department in terms of profit or loss may be readily ascertained for a given period. Not all of the service departments will show a net balance, because in some cases their services are rendered to the operating departments at cost.

The reason for the maintenance of these departments is to be found in the varied manufacturing processes and functions which characterize the packing industry. As has already been indicated, the industry is really a collection of industries, a whole succession of industries, each one of which is expected to stand on its own feet.

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[1] Vol. XXIX, No. 4, April, 1921.

Suppose, for instance, that animal-fat products (a by-product of beef) are transferred to the soap department. To the beef department the transfer is obviously a sale; to the soap department it is a purchase of raw material. Each department pays for all it gets and is paid for all that it gives. Since the soap department represents a distinct business in competition with firms engaged only in soap-making, the soap department of a packing plant is operated along similar lines. All material transferred to this department is valued at the current market price, the price at which competing soap concerns obtain their raw material.

The departmentalization of accounts also provides the packer with statistics on operating costs which enable him to know in what form a given product should be marketed, whether it should be sold in its present state or whether it should be processed further. Bacon, for instance, may be sold either in the cured or smoked state. Hams may be sold as fresh, cured, boiled, or smoked product. The packer who conducts both an oleomargarine and lard compound business has the choice of transferring oleo oil to the oleomargarine factory or of selling it in the open market. The final decision in all such cases will depend entirely upon the cost of processing and the market that exists for the product in each of its various stages. If the packer is to be able to adjust his business quickly and intelligently to the varying demands of the market, he must have at hand complete statistics on the operating cost of each department.

Under the departmental system of accounts, the method of arriving at the dressed cost of beef is as follows: To the cost of the live animal is added the current expense of handling the animal through the packing-house and branch-house organization. This gives total cost. From this total is deducted the value of the hides, according to weight and grade, figured at the actual market value of cured hides, with an allowance for shrinkage in curing and for expense of curing. There is also deducted the value of the fat and other by-products, figured at their full market value at the time the animals are killed, less the cost of processing. Deducting these figures from the total cost (live cost plus the expense of handling) gives the cost of the dressed beef, which, divided by the weight of the beef, gives the cost per pound. This cost compared with the selling price of the beef from a particular lot, informs the packer whether he is making or losing money day by day and week by week. It is the guiding factor in his buying operations.

The following are excerpts from "Unit Costs as a Guiding Factor in Buying Operations," an article in the *Journal of Po-*

litical Economy,[1] by George E. Putnam, commercial research department, Swift and Company.

There is a prevalent notion, chiefly among accountants and business men, that the primary function of a cost-accounting system, say in a manufacturing establishment, is to enable the manufacturer to arrive intelligently at an asking price for his products. According to this notion, which is entertained also by a few economists, the manufacturer determines his minimum asking price merely by adding together the cost of his raw material and the expenses incurred in converting the raw material into a finished product. The better his system of cost accounts, the greater the likelihood that his business will be conducted along profitable lines because unit costs are, or should be, the guiding factor in his selling operations.

In a recent number of this *Journal,* the writer expressed an entirely different point of view as to the function of cost accounting in the meat-packing industry, and stated, without attempting to develop the point, that "It (the packer's cost-accounting system) is the guiding factor in his buying operations."[2] This statement aroused a good deal of criticism from the accounting fraternity, and the question was asked, "Is not the packer's cost-accounting system a guiding factor in his selling operations?"

The purpose of the present article is to show that the packer's cost-accounting system performs one of its chief functions in indicating the maximum price that can profitably be paid for live stock rather than in determining the minimum asking price at which meat and by-products will be offered; and, incidentally, that a system of cost accounts performs essentially the same function in many other industries.

It is unquestionably true that unit costs are a factor in the packer's selling operations. The cost of every product is carefully determined and, in most cases, the sales manager who is responsible for the disposition of a particular product knows its manufacturing and distributing cost. But there is no necessary relation between this cost and the price finally paid by the retailer. In a deficiency market or during a period of rapidly rising prices, the price paid by the retailer may be above cost, while in periods of falling prices or in markets where the consumptive demand has been overestimated, the price may be substantially below. About the only real service which a cost figure renders in this connection is that its possession has a wholesome effect upon the selling agencies—it urges them to put forth greater effort in pushing their products, especially when losses are imminent, with the result that losses for the time being may be prevented or at any rate considerably reduced.

There are at least two important reasons why a packer cannot expect to market his products on a strictly cost basis. In the first place, the greater portion of his products consists of perishable meats which must be moved promptly into consumptive channels. Fresh beef, for instance, must be in the hands of the retailer within two weeks at most after the animals are killed; otherwise it will deteriorate in quality and the trade will discriminate against it. The case would be entirely different if the packer could freeze and hold beef carcasses from one season to another, thereby avoiding forced sales. But the consuming public insists on having fresh chilled beef, with the result that only about 5% of the beef dressed in packing plants is put through the freezing process. The quantity of beef that is cured and canned is even smaller.

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[1] Vol. XXIX, No. 8, October, 1921.

[2] "Joint Cost in the Packing Industry," *Journal of Political Economy,* Vol. XXIX, No. 4 April, 1921), 297.

In the second place, the demand for meat is exceedingly variable. While the total consumptive demand depends primarily upon the relation of meat prices to the prices of other kinds of food, it is affected also by the Lenten Season, Jewish holidays, changes in the weather, and general industrial conditions. Some of these factors can be anticipated with reasonable accuracy by the packer on the basis of his past dealings. But when it comes to anticipating the fluctuations in the total demand for meat in specific communities, fluctuations in the particular kinds of meat required, and the volume of meat products that will be supplied in particular sections of the country by competing concerns, it will readily be seen how impossible it would be for any packer, even during a period of normal business conditions, to market his products on a strictly cost basis. He must be governed in his selling operations by market conditions essentially, rather than by cost considerations.

The effect which price changes have on the general consumptive demand is best shown by a comparison of cattle receipts and wholesale beef prices. The receipts of cattle at the primary markets are subject to wide seasonal fluctuation. During the fall months—after the grass season is over and the corn crop has been harvested—receipts are greater than at any other time of the year, while in the period from February to June, inclusive, receipts are normally small. Since the supply of beef in the hands of the packer is dependent on the number of beef cattle shipped to market, and since only a small quantity of beef can be stored, it follows that more beef must be consumed in the fall than in the spring; also, that the price must be low during the period of large receipts and high during the period of small receipts in order to adjust the consumptive demand to the existing supply.

In estimating the part which the packer's cost-account system plays in this adjustment process, it is to be noted first of all that the demand for live stock is derived from the demand for live stock products, and that the price which the packer can afford to bid for live animals obviously depends upon the price that he can get for meat and by-products less his expense of manufacturing and distribution. When retailers, prompted by the urgent demands of their customers, are willing to pay higher prices for meats, the packer tries to increase the volume of his business in order to realize as large a profit as possible from his operations. And since he can increase the volume of his business only by buying a larger number of live animals in the open market, competition with other buyers forces up the price of live stock.

Likewise, when changed conditions of demand or of supply cause a decline in the wholesale price of meat, the packer may be compelled to reduce the volume of his purchases or operate at a loss. In any case, it is obvious that he cannot afford to bid at the same rate for live stock as before; and since the majority of other packers are confronted by the same conditions, live stock prices fall. Not infrequently, however, a considerable period of time elapses before the balance between the price of live stock and the price of live stock products is restored. Naturally, a packer hesitates to reduce abruptly his volume of business, and thereby increase his unit cost of operation, especially when there is any likelihood that some competitor will be in a position to absorb a part of his regular trade. His plants must be kept in operation, and the requirements of his regular trade must be supplied. Furthermore, it is always necessary to compete with concerns which, on account of faulty cost-finding methods, conduct their buying operation less intelligently. For one reason or another, on a falling market, a packer may be forced for weeks at a time to bid more for live stock than the market price of his products less the expenses of operation.

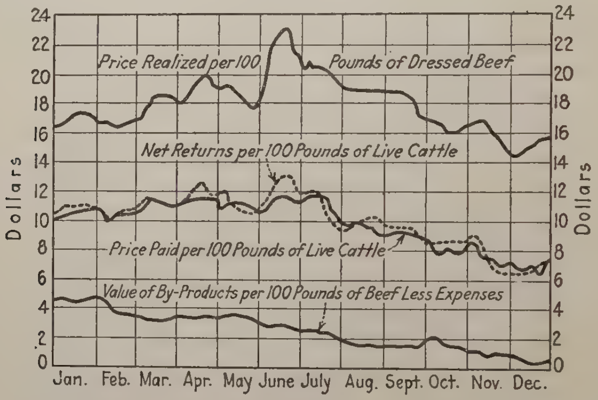
Another point to be noted in this connection is that unit costs vary according to the quality of live stock purchased. In the case of cattle, for instance, the weight of a dressed carcass varies all the way from 45 to 65% of the live weight. Other things being equal, the greater the percentage of dressed weight that can be obtained from a steer, the lower will be the cost per pound of beef.

It is manifestly impossible for a live stock buyer to know in advance the actual cost of the meat that will be obtained from a given purchase. But an experienced buyer is an expert in estimating dressing percentages; and, knowing from current operations the dressed cost of similar lots of live stock, he is able to determine with a remarkable degree of accuracy the dressed cost that will result from a given purchase price. Knowing also how live stock products of a definite quality are selling in the various wholesale markets, he tries to buy live animals at a price that will yield a profit when they are disposed of in the form of meat and by-products. The buyer subsequently learns from the accounting department whether on the basis of existing values the purchase was successfully made.

Thus the calculation of dressed-cost figures serves not only as a guide in determining the maximum price that can profitably be offered for live stock, and the quantity that should be purchased, but also as a check on the efficiency of the live stock buyer. The result of this unit cost service is that live stock prices follow fairly closely in line with the prices obtained for live stock products, and the margin between buying and selling price is normally sufficient to cover the expenses of operation and yield a return on invested capital.

Form 1 shows, with some qualifications to be dealt with later, the weekly financial results for the year 1920 of the cattle operations of the company with which the writer is connected.

As a means of comparing live stock prices with the prices of live stock products so as to show the weekly margins of profit or loss, the sale price[1] actually realized per hundredweight of dressed beef has been reduced to a live basis by taking into account the dressing percentage of each lot of cattle purchased. To these figures has been added the value of hides and other by-products per hundredweight of beef (reduced to a live basis in the same manner) at the time of slaughter, less all manufacturing and distributing expenses except interest. These combined results are indicated on the chart by the broken line which corresponds closely to the solid line showing the prices paid for live cattle. When the broken line is above the solid line, the difference between the two lines represents the margin of profit for that week; where it is below, it represents a loss.



FORM 1.—Weekly Results of the Cattle Operations at Swift & Co., 1920.

It should not be inferred that the weekly margin of profit or loss, as revealed in the chart, is available at the end of each week. Before the margin on a particular week's operations can be determined, all the beef dressed during that week must be sold, and beef cannot be sold immediately after the animals have been slaughtered. It must be chilled for 36–48 hours before it can be shipped, and it may be in transit several days before it reaches the packer's branch house where it is sold to the retailer. Normally a period of two weeks or more must elapse before the margin on a particular week's operations can be finally determined.

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[1] The price of dressed beef, as shown for any one week in the chart, is the average of prices finally realized for all beef dressed during that particular week, irrespective of the time when the beef was actually sold. The price paid for live cattle and the value of by-products (less expenses) are an average of the prices and values, respectively, obtaining in the weeks as shown.

Attention should also be called to the fact that, since the weekly margins of profit and loss are found by deducting the cost of live animals plus operating expenses from the proceeds of beef sales plus the net value of by-products at the time of slaughter, they cannot be regarded as profits or losses actually realized. They are calculated before by-products have been processed and sold, and therefore may have little bearing on the profit and loss statement covering the year's operations.

There is good reason for combining unrealized by-product values with prices actually realized for beef, in arriving at the profit and loss margin, even though this procedure appears to be inconsistent. In the first place, by-products are of much less importance than beef in cattle operations and, under ordinary conditions, they are not likely to appreciate or depreciate materially in value from day to day or from month to month as does beef. The fundamental reason, however, is that it would be inexpedient to wait until all by-products had been disposed of before calculating the margin of profit, because by-products move slowly into trade channels, much more slowly than beef. It requires two weeks, for instance, to convert edible fats into oleo oil, not to mention the time required to sell the finished product. Hides, the most important by-product of beef, cannot be cured in less than 30 days, and it may be two or three months before a sufficient number of cured hides of a particular grade has been accumulated to meet the requirements of a buyer. Under these conditions, if the cost figures are to be of any use either in buying cattle or in selling beef, the packer is virtually compelled to calculate his current profit and loss margins on the basis of unrealized by-product values—or, what amounts to the same thing, to calculate his dressed-beef costs on the basis of existing by-product values—and assume the risk of fluctuation in those values.

This method of procedure proved to be unfortunate for the packer during the year 1920, on account of the tremendous decline in by-product values. At the beginning of the year, the net value of the by-products from a 1,000-pound steer amounted to about $28; by the end of the year the same products had a net value of only $7, or less than sufficient to cover the expenses of handling the animal through the packing-house and branch-house organization. The steady fall in the value of these raw products during the period they were in the process of cure or manufacture made it wholly impossible to realize the tentative margins of profit shown in Form 1, on page 100. As a matter of fact, the average loss per head on cattle operations for the calendar year was 22 cents, and the total loss, $495,125.

One other matter growing out of the fall in by-product values remains to be noted. Reference to the chart shows clearly that with the fall in by-product values, the spread between the price of beef and live cattle per 100 pounds became substantially wider. At the beginning of the year the price of beef per pound was about 160% of the live price, while at the end of the year the percentage had increased to more than 200. This change in the relationship of cattle to beef prices at once suggests the question: What effect did the fall in by-product values have upon the wholesale price of beef? Did it result in making beef prices higher than they would have been otherwise, or did it have no effect of any consequence?

It would be contended by some of those to whom this article is addressed that the fall in by-product values automatically and immediately raised beef prices. Their argument would go somewhat as follows: The prices asked for beef and by-products together must be high enough to cover the cost of live cattle, plus the expenses of operation. If the value of by-products falls, the cost of the beef rises accordingly, and the packer must get more for his beef in order to come out even.

The fallacies in this argument are at once apparent. If it were possible to raise the price of a perishable product like beef, simply because by-products had fallen in value, and at the same time move the whole supply into consumptive channels, it would likewise be possible to prevent the value of by-products from falling below cost. The main fallacy, of course, lies in the assumption that the price of live-stock products depends upon live-stock prices. The causal relationship is just the reverse. A decline of $1 in the value of the hides and other by-products per 100 pounds of live cattle will cause a corresponding decline in the price of live cattle—assuming that operating cost and the demand for beef remain unchanged—and widen the spread between cattle and beef prices. Likewise, a rise in the values of by-products will cause an increase in the price of live cattle by a corresponding amount, and narrow the spread between cattle and dressed-beef prices.

Obviously, it is the price of cattle, rather than the price of beef, that is immediately affected by a fall in by-product values. The price of beef could not rise in this case except through a diminution in the number of cattle shipped to market, and since cattle already produced must be sold whether the price is high or low, it follows that a slight fall in cattle prices could have no appreciable effect, for the time being, in diminishing the supply of beef or in raising beef prices.

There is no denying the fact, however, that a steady decline in by-product values will sooner or later affect the price of beef by reducing the supply. Declining cattle prices will ultimately curtail cattle production; and even before there has been an actual reduction in the number of cattle produced, many of the cattle being prepared for shipment will be marketed before they are properly finished. In either case the supply of beef will be diminished and, other things being equal, beef prices will be higher than they would have been had not the value of by-products fallen.[1]

A somewhat similar conclusion, in so far as it concerns the long-time effect upon beef prices, would be reached by those who contend that unit costs are a guiding factor in selling operations. But they would reach this conclusion more by accident than through a process of careful reasoning. In contending, as they do, that unit costs determine the manufacturer's minimum asking price, they completely overlook the subtle but fundamental fact that the price paid by an intelligent enterpriser for raw material is dependent first of all upon his unit costs of operation and the price at which he thinks he can sell his finished products; therefore, the guiding service which unit costs may appear to render in enabling the manufacturer to determine or to realize his minimum asking price is merely one of repetition—it is a service which was previously rendered in the buying operation. . . . The fundamental point for which the writer contends is that in the case of both perishable and non-perishable products, unit costs, although appearing to guide the seller, perform their real guiding function at the time goods are purchased for resale. Any service which they subsequently render is in the nature of reminding the seller of the price at which he originally expected to sell with the result that he may put forth greater sales effort in trying to realize this price.

It does not follow, however, that sellers will realize the prices they anticipate—witness the losses occasioned by the recent price decline—even though the product in question is non-perishable. For, after all, unit costs do not determine prices. While it happens to be true, according to current economic philosophy, that the price of a finished product tends to be equal to marginal cost—*i.e.*, the cost of the raw material entering into the product plus the unit costs of operation in the most inefficient firms—the real chain of causation is not from the price of the raw material through cost of manufacture and distribution to final consumers' price. It is exactly the reverse. It is human desire that leads to human effort, demand that leads to supply, and therefore present and prospective consumers' prices that lead to producers' prices.

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[1] It is impossible to determine just how long a period of time would be required to bring about this result. The question cannot be answered by a study of live stock receipts and prices in the primary market because (1) not all of the receipts are purchased by packers, and (2) there are wide variations in the demand for beef, in the live weight of cattle slaughtered and in dressed yields. Under these circumstances, the statistics of receipts do not afford a dependable barometer of the forthcoming beef supply or of beef prices.

If you were to install a cost accounting system for a meat concern, how would you endeavor to account for all the products?

5. Minerva Glass Company

CONTROL OF SALES: WHAT RECORDS SHOULD BE KEPT IN ORDER TO OBTAIN A CONTROL OF SALES ACTIVITIES AND ON WHAT BASIS SHOULD THEY BE DEVELOPED?

In connection with the application of standard costs in the Minerva Glass Company the committee working on the system had included the development of reports on sales activities to be rendered to salesmen and their executives.

The statement from which these reports were developed was the office copy of the regular sales invoice. On this document, in addition to the items and extensions at the sales price, the standard factory cost of the articles was also entered and the items sold classified according to groups of products. These invoices were grouped according to salesmen and branch offices and the information on them copied on two similar forms, a separate report being made up for each salesman and each sales office, at the end of every four weeks' period.

The first of these forms was known as the Cost of Sales—Distribution Sheet on which there were columns for the Invoice Number, Customer's Name, Total Cost of Goods Sold, Explanation, Miscellaneous, and for the different classes of products. One line on this form was used for entering the information required from each invoice. The "Explanation and Miscellaneous" columns were provided for non-sales items to be deducted from the total sales. The columns on the form were totaled which gave the cost to make and pack, administrative expenses having been distributed through general burden, for the total sales and for each class of sales. From these totals was deducted the cost of any returns or allowances made, the amounts being obtained from credit memoranda, after which shipping charges were added, being taken as 2.5% of the net cost of goods sold. The final result was the total factory cost.

The second form was made up identically with the first except that the selling prices were used. After adding the columns and deducting for returns and allowances the net sales figures were obtained. The total factory costs as previously developed were then entered on this sheet and the difference taken between the two sets of totals, giving the manufacturing profit at standard cost. The next deduction made was for the salaries and expenses of the salesmen, the remaining figure being known as "Profit above Direct Cost." From these totals was taken the share of Selling and Commercial Expense allocated to the different lines, the results obtained being the net profit or loss made by each salesman in total and for each line in which he had made sales. These figures were further shown as percentages of net sales. The statements of sales were made up in duplicate, the second copies being sent to the salesmen for their general information and as their commission statements if they were working on that basis.

After having completed these statements the summary information was transferred to another statement known as the "Sales and Profit Analysis." This report was made up as a printed form with a line for each class of products, and ruled vertically in sections of three columns each, the columns being headed, "Net Sales," "Net Profits," and "Percentage of Net Sales." In the first section was entered the total sales by lines made by the company for the period. In the succeeding sections these totals were broken down into the sales made by each branch office and by the salesmen working out of each office. The last two lines on the form were used to enter the returns. Then to the total net sales figure were added all deducted items such as the returns and allowances which gave, as a statistical figure, the total gross sales for the period. The report was therefore a summarized statement of the activities of the sales department so rendered that it was possible to see on what lines profits were being made and what salesmen were actually producing results, and in what lines they were making sales.

Should the company have used standard manufacturing costs in the compilation of these sales reports? What is the advantage of their use? May their use give a wrong impression? Should an adjustment be made if standard costs are used?

Do the reports made up meet the needs, so far as sales activities are concerned, of the general executives, sales excutives, and the salesmen? If not, what further information should be furnished these different classes?

PART II

PRODUCTION COSTS

II

ELEMENTS OF COST

A. MATERIAL COSTS

1. Randolph Machine Company

MATERIAL CONTROL SYSTEM: WHAT EFFECT DOES THE SIZE OF A COMPANY HAVE UPON ITS SYSTEM OF INVENTORY CONTROL?

The products of the Randolph Machine Company included approximately 50 different types of machines which were used to wind wire, rope, twine, and thread varying in size from the finest strands to strands one-half inch in diameter. The chief consumers of these products were textile mills and electric magnet manufacturers, the volume of business with these consumers being about $12,000,000 a year.

The plant, in the main, consisted of a foundry and a machine shop, each being a separate entity. The machine shop was a three-story building in the form of a U, the storeroom being located in the center of the first floor. Approximately 1,000 men were employed in this shop, and their output varied between 8,000 and 9,000 units per month.

Production control methods and company organization for production had been carefully worked out by Taylor. Every operation and function performed in the manufacturing organization had been studied and the method of procedure carefully outlined. The functional divisions of the work, however, were not carried as far as Taylor had recommended. Upon receipt of orders the company assembled machines from parts it had already manufactured and held in stock, which production procedure required the company to keep ample stock of parts on hand at all times.

MATERIAL HANDLING AND CONTROL ORGANIZATION

The foremen of the various departments that handled materials were directly responsible to the general superintendent of the plant. The foremen of the manufacturing departments, on the other hand, were responsible to the manufacturing superintendent who, in turn, was responsible to the general superintendent. There were 12 people employed in the stores receiving room, 40 in the storeroom, and 15 in the balance-of-stores department, the latter department being located in the planning room.

Two separate storerooms were maintained, one for purchased materials and the other for manufactured parts. Most of the castings used were small and were kept in wooden bins in the basement; the bar stock was stored on horizontal racks. This stock was priced by the foot for cost purposes although it was purchased by the pound.

The main storeroom was laid out in sections with 24 by 24-inch bins. Each section consisted of two rows of bins, back to back, with a passageway between the double sections, the aisles thereby having open bins on either side. The rows were designated by capital letters A, B, C, etc. The tiers of bins in each row beginning from the bottom were designated by small letters, and the vertical rows of bins proceeding away from the center aisle were numbered. Thus, a bin in the fifth row, third tier from the bottom, the seventh section in from the aisle would be designated by capital E-c-7. Although a card index was kept of the location of all material, it was not often referred to, as all raw material was arranged according to use, and all work material according to the size and type of machine of which they later became a part.

Material was kept in trays which fitted the bin compartments in such a way that transfers of materials from one location to another were greatly facilitated. The double bin system was used, all material received being placed in one tray and all requisition material being taken from the other, a separate bin tag being kept on each tray on which the amount received and issued were recorded. When the delivery tray became empty, the tags were shifted, the receipt tray becoming the delivery tray and being tagged accordingly, and the delivery tray became the receipt tray and was tagged as such. At the time of shift, a definite check of the material on hand against the Balance-of-Stores Card was made. The system, as worked, always resulted in the old stock being used up first.

For each item, no matter how small, a Balance-of-Stores Card was made out; the entire stock required over 20,000 cards. Special material was entered upon a separate sheet and placed in the unclassified stores, where it remained until it was delivered to the person who ordered it. Maximum and minimum limits were established for all items and recorded on the Balance-of-Stores Cards along with the quantity to reorder. When the material available dropped to or below the minimum, it automatically became a signal to reorder the quantity named.

RECEIVING AND INSPECTING

When material was brought into the receiving room, the clerk in charge filled out a Notification of Materials Received (Form 1), which is shown on next page.

The inspector, after checking the material, filled in the above slip for the quantities accepted and rejected, after which the material accepted was forwarded with the receiving slip to the storeroom; rejected material was held until notification of its disposal was sent to the office clerk by the purchasing department. The material sent to the storeroom was placed in its proper bin and proper entries were made on the bin tags. The receiving form was then sent to the balance-of-stores department, where cost entries were made, and the quantity and amounts were entered on the Balance-of-Stores Cards (Form 2), shown on page 113.

In the "On Hand" section of the card were placed the "Cost" columns, transportation charges being added to the purchase price of the goods to obtain the total cost. The unit cost was worked out as an average cost of the different lots in the storeroom. The cost of worked materials was obtained, on the other hand, by keeping a record of the costs of the different lots produced; at the end of each six months' period these costs were averaged to obtain a new standard unit cost to be used for accounting purposes.

NOTIFICATION OF MATERIAL RECEIVED

From No.

On Purchase Order No. P , I have this day received the

following total quantities Signed____________________Date

Storeskeeper or his representative

Symbol	Total Quantity Received	Kind of Unit	Net Weight	Quantity Accepted	Quantity Rejected	Weight of Rejected	Total Cost	Remarks

I have inspected the above materials and find them as stated.

Signed____________________________________

Inspector or Requisitioner

I have entered the above materials on Stores Tags.

Signed____________________________________

Storeskeeper or his representative

	Pur. Agt.	Auditor	I have entered the accepted quantities on balance sheets, including the price $
			Plus $ for Freight Express Mail Signed____________Date Balance Clerk

Randolph Machine Co.

Form 1.

REQUISITIONING

When the balance-of-stores department, by its records, found that it was necessary to order more work parts for stock, it filled out a Notification to Manufacture Slip which was sent to the clerk who was in charge of all the preliminary work necessary to get an order into production. This clerk made out a triplicate manufacturing order, the first copy of which was filed at the clerk's desk for reference, and to check the order as it progressed through the plant. The second copy, which specified the material required for the order, was sent to the balance-of-stores depart-

Description

Balance of Stores Kind of Unit

When Quantity Available Falls to

Issue Order for

Location in Stores

Symbol

S

Instructions for Posting
- A. When Stores Are Ordered, Add the Quantity to Columns 1, 1A, and 4.
- B. When Stores Arrive, Subtract the Quantity Received from Columns 1 and 1A; Add Quantity Received to Column 2.
- C. When Stores Are Apportioned, Subtract Quantity from Column 4, and Add Quantity Apportioned to Column 3.
- D. When Stores Are Issued, Subtract Quantity from Columns 2 and 3.

Time Allowance for Delivery Weeks

NOTE: In All Cases Bring Down at Once Balance on Hand in Each Column Affected and Verify That the Sum of Columns 1A and 2 Equals the Sum of Columns 3 and 4.

1 Stores Ordered But Not Yet Available						1A	2 Stores on Hand in Store Room						3 Stores Apportioned to Orders But Not Yet Issued				4 Stores Available, That Is: On Purchase Orders and on Hand		
Date of Requisition	Requisition No.	Purchase Order No.	Quantity on Each Order	Date Received	Shortage	Total Quantity on Order	Date Received	Quantity	Date Issued	Issued for Order No.	Total Cost	Cost per Unit	Date Apportioned	Quantity	Order No.	Date Issued	Date	Quantity	Remarks

Randolph Machine Co.

FORM 2.

ment where an apportionment or reserve was made on the Balance-of-Stores Sheets for the material required, after which the copy was returned to the clerk, who noted on the original copy that this work had been done. The second copy of the slip was sent to the cost department where the cost sheet was reckoned; this sheet being filed until the job was completed, and the entire cost incurred entered upon it. The second copy was then returned to the clerk, who again noted on the file copy that this work had been done.

The order-of-work clerk then took the second copy and secured the Route Sheet for the production of the part or parts ordered. The order-of-work clerk then made out the Material Requisition (Form 3, on next page) for the stock required.

In addition to this, an Identification Tag to go with the order throughout the shop was filled in along with a "Move Order" telling when the material was to be delivered. The same clerk made out all the Job Tickets, Move Orders, and Inspection Slips that were required for the processing of the material. These slips, with the second copy of the Manufacturing Order, were returned to the clerk who again indicated on the file copy how far the work had progressed. The second copy of the Manufacturing Order was then filed until the job was complete; likewise, the Route Sheet was also returned to its file.

The third copy of the Manufacturing Order was sent to the production clerk to notify him that the job was going to the shop. The starter clerk then received all the forms filled in by the order-of-work clerk, sending the Material Requisition, the Identification Tag, and the first Move Order to the storekeeper, who issued the material by delivering it to the location named on the Move Order. The foreman in the department receiving the material signed the Move Order, which was returned to the routing department. After the operations had been performed on a machine, the inspector filled out the form which had been sent to him, and returned it to the routing department. The clerk then took the next Move Order and gave it to the head move man. All material was moved around the shop by Move Orders, the head man directing a number of helpers who operated electric platform trucks.

A final inspection was made of the parts when they were com-

MATERIAL REQUISITION

Stores Symbol S	Charge to

Location	Quantity	Kind of Unit	Cost per Unit	Total Value

For

	Month	Day	Year
Stores Issued		Written	
Storeskeeper: Please Issue Above Stores		Wanted	
To		Issued	

Signed Received

Appor-tioned	Balance Sheet	Cost Sheet	Stores Described Have Been Issued
			Signed by Storeskeeper or his clerk

Randolph Machine Co.

Form 3.

pleted, a special Inspection Slip being made out and sent to the first clerk, who still held the original copy of the Manufacturing Order. The clerk checked the two forms for agreement as to the number of parts; if the agreement was close the original copy was sent to the production clerk who marked the order closed, the completed Manufacturing Order being held until the end of the week when it was sent to the balance-of-stores department to be checked against the record of parts received into stock.

For the assembly of machines, a special system of requisitioning stores was established. As orders were received, two different specification sheets were made out in triplicate; one sheet listed the standard parts used with the general type of machine, and the second listed the extra or changed parts as specified in the particular order. The first copy was sent to the assembly department, the second to the planning department, while the third was kept in the specification department. In the planning department, the clerk made out three slips for each order, the first of which he filed by type of machine, the second, by date wanted, and the third by customer. Ordinarily about five weeks expired between the receipt of an order and the shipment of the finished machine.

Machines were assembled by types in groups of 20 or 30 which were equal to about one day's production in the assembly department. The clerk, by referring to his files, determined what group was to be made first, and then forwarded the Parts Sheet for that lot of machines to the stores department. The parts were loaded on trucks and held until required by the assembly foreman; the collection of materials was relatively easy as the parts for each type of machine were kept in adjacent sections. The Material Sheets were forwarded to the balance-of-stores department, so that the correct entries could be made on the Balance-of-Stores Cards.

The stores issues were forwarded from the balance-of-stores department to the cost department, where they were sorted by job numbers and placed in trays behind Cost Collecting Cards. In these trays were also collected all charge slips for labor and burden on the different shop orders. At the end of each week the total of all labor material and burden charges was accumulated, entered on the Cost Cards which were designed to accumulate cost for two months. When the order was complete, the Cost Cards formed a summary of all expenses charged against the job; the information was transferred from them to the Cost Sheet previously referred to, which was the final record.

Was the material control system here outlined adequate for a firm having a $12,000,000 volume of business?

Draw up a Flow Sheet for the recording system showing the path followed by the various forms.

2. Clyde Shipbuilding Corporation

MATERIAL ACCOUNTING: HOW SHOULD MATERIAL COSTS BE TRANSFERRED FROM THE PURCHASE RECORDS TO THE JOB ACCOUNTS?

Materials used by the Clyde Shipbuilding Corporation were accounted for in two general categories: first, standard commercial materials such as were used in considerable quantities throughout its extensive shipbuilding, ship repairing, and plant maintenance operations, and which were purchased into the Stores account and requisitioned out to jobs in the usual manner, the price being an average cost of the various lots purchased plus the freight on them; and second, special order materials consisting chiefly of large bulky items, made-to-order equipment, and many items of smaller materials unusual to the regular line of stock materials but required to meet conditions peculiar to the design or specifications of a particular ship. Materials in the second category, upon arrival, were stored in the warehouses until called for, or delivered directly to the jobs if construction conditions permitted. All such items of material were kept segregated from the regular line of stock materials and were charged directly to the Job accounts at invoice price plus freight.

In handling the Material accounts, two questions had arisen; one related to charging all material to the Stores account whether in the first or second category mentioned above, so that all material cost entries to jobs would be handled uniformly through the Stores account when the material actually entered the production processes; the other was the possibility of charging all cost of operating the storerooms and warehouses to the Stores account and distributing this cost to Job accounts as part of the cost of materials. Since shipbuilding is strictly neither a construction enterprise nor manufacturing, but a combination of the two involving wide ranges of operations in both industries, it was necessary to adopt some accounting procedure that would be sound and equitable as applied particularly to shipbuilding.

The stores manager was, in general, the custodian of all materials until delivered to the points of use, whether charged to the Stores account or held in the warehouses charged to the Job accounts, but he was especially charged with the responsibility for keeping the investment in stores inventories to a minimum consistent with the economic supply of normal demands for immediate delivery from stock. He was in favor of the idea of purchasing as much material as possible to be charged directly to the Job accounts to avoid wide fluctuations in his stores inventories and thereby afford better control of inventories.

On the other hand, the production department, in checking the progress of work and cost on a particular job, found frequent items of material charged to the job but not physically present in the production processes which was disturbing, if not directly misleading, in analyses of trends of progress and total cost. Moreover, items passing through the Hollerith stores inventory system had their identity duly recorded in that system, whereas, items charged to jobs directly from the invoices could be identified in the Cost accounts only by reference to the Invoice Register and often to the invoices themselves for itemized lists.

Also, the design departments favored purchasing many items of special materials into the Stores account because the lists of such materials had frequently to be made out from preliminary designs and surplus amounts were ordered to provide for design developments and possible changes in design. In such instances the surplus material would remain in stores without further attention on the part of the design engineers.

The operative departments favored purchasing special materials into stores because it facilitated the borrow-and-pay-back accounting for the interchange of similar materials used on different jobs sometimes desirable in carrying out the production schedules. As opposed to this method the stores manager took the position that surplus quantities of special materials should remain charged to the jobs until the needs of the jobs had been supplied and then, by agreement with those concerned, the surplus materials disposed of to the Stores account, Scrap account, or otherwise, to the best advantage giving credit to the cost of the jobs for the surplus materials at agreed prices. The Stores account was available for such items as gave promise of being readily salable to other jobs at cost price, the Scrap account was a subsidiary account under the control of the stores manager, was not inventoried nor taxable, and was available for such items as gave little promise of being used in its purchased form and in which other such items were accumulated in suitable quantities for sale as scrap. Another means of disposal of surplus items was to sell them in purchased form to employees and others for what they would bring.

The stores manager thought that the control of the amount of surplus materials through having them brought to the attention of the design departments and others from time to time and the opportunity afforded for planning to make use of them, if possible, on later jobs rather than have them remain in the Stores account without such attention, more than offset in benefit the time consumed in listing the surplus materials and in the routine of making the necessary adjustments in the Cost Records.

To the second question, that of charging the cost of operating the storerooms and warehouses to inventories, the stores manager was opposed. These operating costs had previously been charged as a part of the general overhead burden and he believed it should continue to be so charged. Among his reasons for this position were, first, that the classification of overhead expense provided him with monthly statements of his operating expense which by comparison with the total volume of purchases afforded a general control of his expense against business handled which he considered a better control than would otherwise be probable. Second, there was the difficulty of devising a suitable formula for distributing the operating costs upon the wide variety of materials handled, for manifestly neither bulk, weight, cost, nor unit prices would form an equitable basis upon which to prorate the operating expense.

There were others, however, who held the opinion that each element entering into a job should, so far as possible, carry all of its cost at the point of application to the job and the more costs that could be disposed of in this manner directly to jobs the less would be the probability of unabsorbed burden having to be deducted from profits. On the other hand, if the operating costs were added to inventories there was a possibility that such costs might tend to pyramid in the inventories with the result that adjustments would have to be made through the Profit and

Loss account. If suitable means could be found for distributing the operating costs equitably upon the various kinds of materials handled and without pyramiding there would be better argument for charging the cost of operations to inventories.

Would an advantage be gained or a disadvantage suffered by charging all materials through the Stores account irrespective of whether the materials were of the regular line ordinarily stocked or special orders purchased for a particular job?

Discuss the problem of charging inventories with the cost incurred in operating the storerooms.

Do you consider the practice of adding freight to inventories and using an average price to be sound in this case?

3. Stockbridge Small Arms Company—No. 1

MATERIAL COSTS: HOW SHOULD MATERIAL COSTS BE ACCOUNTED FOR, TO PROTECT THE INTERESTS OF ALL PARTIES TO A COST-PLUS CONTRACT?

In March, 1918, the Stockbridge Small Arms Company entered into a contract with the United States Government for the manufacture of a machine gun. The contract necessitated the building of a new plant in Stockbridge, and called for payment by the Government for the expense of erecting the plant. The Stockbridge Small Arms Company, with the approval of the Government, placed the order for the construction of the building with the Platt and Drew Construction Company of New York. To make sure that the true costs of building should be ascertained for payment, the auditor of the Stockbridge Small Arms Company drew up a plan of procedure to be followed by and between the Platt and Drew Construction Company (hereinafter called the Construction Company), the Stockbridge Small Arms Company (hereinafter called the Superintendent), and the United States Government (hereinafter called the Owner). In this plan the following provisions were included:

MATERIAL DIVISION

Purchase Authorization

It is required that the Construction Company obtain three competitive bids, wherever possible, for all materials or work the value of which is estimated to exceed Three Hundred Dollars ($300). With respect to the freight charges involved, it is recognized that commodities are quoted upon varying terms of delivery, such as "f.o.b. point of shipment," "some stated freight allowance" or "delivered point of delivery."

There need be no uniform practice adopted with respect to the manner of submitting bids, but it shall be understood that all bidders must clearly specify freight terms, and in case of quotations other than freight allowed to Stockbridge, or delivered to Stockbridge, that the vendors must supplement their bids with a figure representing the amount of freight that will be incurred. Bids or Purchase Authorizations are unnecessary for purchases of the estimated value of $300 or less. After receipt of the bids, they should be summarized upon the Purchase Authorization in quadruplicate, in the form prescribed, all copies of which should then proceed through the following channels for the purpose of authorization:

(*a*) Rendered by Purchasing Department.
(*b*) Transmitted to Resident Engineer of Superintendent.
(*c*) Examined and approved by Resident Engineer of Superintendent.
(*d*) Transmitted by Resident Engineer of Superintendent to Resident Engineer of Owner.
(*e*) Examined and approved by Resident Engineer of Owner.
(*f*) Resident Engineer of Owner will retain for his files the original copy and distribute the remaining copies as follows:

    1. Duplicate copy to Construction Company (New York Office).
    2. Triplicate copy to Construction Company (Purchasing Department).
    3. Quadruplicate copy to Superintendent (Resident Engineer).

The Purchase Authorizations should be consecutively numbered and each number should appear upon its respective Purchase Order and Invoice to facilitate their identification with the Authorizations in which they originated.

Purchase Order

(*a*) The Construction Company may issue Purchase Orders for less than three hundred dollars ($300) without Purchase Authorization, but when Purchase Authorizations are required, it shall be the duty of the Construction Company to note upon the Purchase Order the Purchase Authorization number to facilitate identification.

(*b*) Certain provisions are made in the contract between the Construction Company and the Superintendent whereby the former is permitted to incur proper expenses in connection with the performance of this work. The Construction Company is required to issue separate purchase orders on the regular form for all such expenses, to make possible a regular form of procedure for the auditing of these disbursements.

(*c*) In the case of blanket purchases, such as telegraph service, telephone service, et cetera, blanket Purchase Orders should be sent to each vendor and each billing applying thereto should be posted by the invoice clerk to his copy of the Purchase Order, in the same manner as he will post all invoices of vendors.

(*d*) Purchase Orders issued with Purchase Authorizations require to be approved in turn by the Superintendent and the Owner; the only copies that require that process will be Number 3 for the Construction Company and Number 8 for the Superintendent. All copies should proceed through the same process as Purchase Authorizations described in the first paragraph.

(*e*) This form should be rendered in as many copies as may be required by the various parties, but at the present time it is thought that 12 copies are sufficient. These are printed and distributed as outlined in the following tabulation:

Color	Copy	For	Department	Printing on Reverse
White (orig.)..	1	Vendor	N. Y.	Terms, etc.
Yellow...	2	Construction Co.	N. Y. Office	Terms, etc.
Blue.....	3	Construction Co.	Purchasing Dept.	Terms, etc.
Pink.....	4	Owner	Mr. Greene	Terms, etc.
White....	5	Owner	Mr. Greene	Terms, etc.
White....	6	Owner	Mr. Greene	Terms, etc.
White....	7	Construction Co.	Cost Dept.	Terms, etc.
White....	8	Stockbridge Co.	Engineer	Terms, etc.
White....	9	Stockbridge Co.	Invoice Dept.	Spec. ruling for INVOICE
White....	10	Construction Co.	Invoice Dept.	Spec. ruling for INVOICE
White....	11	Stockbridge Co.	Storekeeper R. C.	Spec. ruling for Store
White....	12	Construction Co.	Storekeeper R. C.	Spec. ruling for Store

(*f*) The twelfth copy, which is for the receiving clerk of the Construction Company, will serve as the means of identifying shipments, the receipt of which will be recorded thereon; freight bills also will be identified with and posted on this copy.

(*g*) The tenth copy, for the Construction Company, will be utilized by the invoice clerk for the purpose of posting thereto the vendor's bills in the form prescribed, and for preventing duplicate bills being passed for the same material or services.

(*h*) The ninth and eleventh copies for the superintendent are used for auditing. The superintendent also prescribes that the tenth and twelfth copies in the hands of the Construction Company, shall both be filed by Purchase Order Number.

(*i*) The superintendent is not interested in other copies retained by the Construction Company and therefore does not prescribe any filing method for them.

Numbering of Purchase Orders

Purchase orders must be numbered consecutively and must carry the number of the Purchase Authorization under which they are issued. No numbers must be vacant or unaccounted for.

Receiving Record

This record is provided in duplicate and should be numbered in series, prefixed by letters, so that the identification and sequence of reports can be established. It should be rendered by the field receiving clerk upon receipt of shipments, and after their contents have been checked or counted.

Both copies should be forwarded to the receiving clerk for the following procedure:

(*a*) The original copy should be:

1. Utilized for comparing the quantity reported as being received with that billed by the vendor.
2. Stamped by the receiving clerk as evidence of its having been checked with the bill.
3. Submitted to the superintendent's office for his stamp of approval.
4. Filed with the superintendent's (receiving clerk) copy of Purchase Order.

(*b*) The duplicate copy should be retained by the Construction Company's receiving clerk for whatever purpose the Construction Company may require.

It is understood that the Construction Company will not sell or otherwise dispose of any material without first obtaining the approval of the Superintendent.

ACCOUNTING DIVISION—ACCOUNTS PAYABLE

Accounts Payable Voucher

(*a*) This form is provided in quadruplicate and is designed for its rendering by the vendor. Each Purchase Order should be accompanied by as many sets of those vouchers as, in the opinion of the purchasing agent, will be required for billings on the Purchase Order.

(*b*) The Accounts Payable Voucher set, upon its receipt, should be stamped with the date of receipt upon the original copy by the mailing department. The set should then be forwarded to the invoice clerk, to be treated as follows:

1. He must see that all information as to Purchase Order Number, Purchase Authorization, delivery terms, et cetera, is properly entered in the spaces provided. The invoice clerk should also supply copies of the voucher to replace any that may be missing.

2. They should be checked against the respective Purchase Order as to accuracy of quantity, prices and extensions, and posted in brief on the reverse side of the invoice clerk's copy of the Purchase Order. Cash discounts should be calculated and deducted upon each copy of the voucher, and the net amount shown thereon, in order that only the net amounts of each bill may pass through the records. The foregoing should be inserted upon all four copies, but signatures certifying their accuracy should appear only upon the duplicate, triplicate, and quadruplicate copies.

Each day's Accounts Payable Vouchers, after being checked and approved for accuracy, will promptly be numbered in quadruplicate and distributed as follows:

(*a*) The original copy should be passed to the Accounts Payable Ledger bookkeeper, posted to the ledger, and returned to the invoice clerk. He should then utilize this copy for the purpose of paying such bills as are subject to cash discount previous to the receipt of material (providing original Bill of Lading has been received) and stamping it to indicate the day on which the check was rendered. It is understood that arrangements can be made with local vendors whereby their invoices may be discounted at a regular date each month; it is expected that this arrangement will enable the Construction Company to receive the materials before paying local vendor's invoices. Paid and unpaid invoices should be filed alphabetically, prior to receipt of the material billed; after which the original, if unpaid, should be retained pending the payment of the bill. All paid bills on which material has been received should be filed numerically. The invoice clerk, who will have charge of the checking of Vendor's bills, should provide files for active and closed Purchase Orders. As soon as an order is completed and billed, it should be removed from the active files and filed numerically in the closed files.

(*b*) The Duplicate, with triplicate and quadruplicate copy, is sent to the cost clerk for posting to his distribution files, then returned to the invoice clerk, who will forward the three copies to the receiving clerk where they should be retained pending receipt of the material, at which time the duplicate is receipted by him and returned to the invoice clerk. All copies should be transmitted to the superintendent to be receipted and approved by him, after which triplicate and quadruplicate copies will be returned to the invoice clerk.

(*c*) The Triplicate copy should be used by the Construction Company as a supplement to its periodic bill against the superintendent for disbursements.

(*d*) The Quadruplicate copy may be utilized by the Construction Company as it may require.

3. If an error is discovered in the bill as rendered by the vendor, the invoice should be returned to the vendor by the invoice clerk with the request that correction be made. Should an error in quantity or quality be discovered by the receiving clerk, he should make deductions, if possible, upon the face of the duplicate, triplicate, and quadruplicate copies, or by attaching a claim memorandum showing the reason for making a claim, thus drawing the special attention of the invoice clerk to such deductions. The latter should render Debit Memorandum.

Debit Memorandum

This form should be rendered in quintuplicate, numbered and registered in the same numerical sequence as the Accounts Payable Vouchers but entered in red upon the Accounts Payable Register and its distributions. The original copy should be forwarded to the vendor; duplicate, triplicate, quadruplicate, and quintuplicate should be attached to the Accounts Payable Voucher copies and proceed through the same process as the copies of the Accounts Payable Voucher set.

Packing List

This form is provided in triplicate for attachment to each voucher payable. It contains a statement of the contents of the various packages in such form as to render checking easy. It should proceed through the same channels as the corresponding Accounts Payable Voucher, and eventually be attached to it.

Accounts Payable Register

(*a*) This form should be rendered in duplicate (for the use of the Construction Company) and provides for the listing of every Accounts Payable Voucher in numeric sequence by date of invoice, name of vendor, and net amount of bill. Provisions are also made upon this form to enable tracing of all copies of Accounts Payable Vouchers excepting the original, throughout the various stages through which they must proceed for various approvals.

(*b*) The tracing procedure will be that of treating the carbon copies of the Accounts Payable Voucher as a unit, and entering the date of their being forwarded to each department, as well as the date when they are returned from each department, to the invoice clerk. In other words, all the carbon copies should be forwarded to the respective departments through the invoice clerk, and in no case should one department pass the voucher to another department without first having it passed for record by the invoice clerk.

Accounts Payable Ledger

(*a*) It is required that the Construction Company maintain a ledger account with each vendor in the usual manner of keeping detail ledgers. Its entries will be obtained through the following media:

1. Credits—Original copy of Accounts Payable Voucher as outlined.
2. Journal Entry Voucher—Entries of this nature will be very rare, because it is the requirement that if possible all credits due vendors should pass through the Accounts Payable Register. When it is found necessary to pass a credit through a Journal Entry Voucher this form should be duly approved by the superintendent, in the same manner as is required for his approval of Accounts Payable Vouchers. Occasionally there may be necessity for cancelling a debit memorandum, which will require the crediting of the vendor. In such a case a debit memorandum should be used in its reverse form.

(*b*) Monthly this ledger should be balanced with its controlling account by requiring that the bookkeeper prepare a detailed statement of the ledger showing vendors' names and the balances of the accounts.

Voucher Check

(*a*) This form should be rendered in triplicate—the details upon a typewriter and the written amount of the check upon a "Protectograph." It should be prepared from the original copy of the Accounts Payable Voucher in the case of bills paid prior to receipt of material, and from the triplicate copy of the Accounts Payable Voucher when drawn in payment of bills for which material has been received, and properly approved. The duplicate copy should be the medium for posting to the Check Register and afterward filed alphabetically with its respective vouchers, by the Construction Company, and the triplicate copy should be furnished to the superintendent for its files.

Check Register

(*a*) This form need only be in a single copy and is for the purpose of recording daily from the duplicate copy of the voucher check the details of each check that is being paid. It should be totaled monthly for the purpose of posting to the controlling accounts, charging Accounts Payable and crediting Cash account.

Construct a chart showing the origin, route, and final disposition of the forms used in this procedure.

Were the instructions for handling the Accounts Payable Vouchers consistent with those covering the receiving record and the voucher check?

What was the purpose of the debit memorandum?

Was the handling of the packing list satisfactory?

4. Oxbow Paper Company

MATERIAL COSTS: AT WHAT PRICE SHOULD MATERIALS BE CHARGED TO PROCESS?

The Oxbow Paper Company owned and operated a mill on the St. Croix River in the northern part of Maine. It manufactured a pulp paper, indicating that its product was of the cheaper grade used chiefly for newspapers, cheap magazines, telephone directories, catalogues, and the like. In addition to its mill, the company owned large timber tracts of spruce, poplar, and fir.

The company had purchased most of its timber lands many years ago when the prices of such lands were much cheaper than they were when the logging was done. The company at the time of purchase had had a thorough cruise of the properties made in order to ascertain the boardfeet content of the various types of wood in the tract and to determine the fairness of the price. The three types of wood purchased were entered on the ledger as current assets at their cost, which was computed by taking the percentage of the purchase price that the boardfeet of each type represented of the total boardfeet purchased. As the timber was cut and floated down the river to the mill the timber inventory accounts were credited at cost. The stumpage land left after cutting had no value because there was little or no farming in the region adjacent to the mill. The company had never made any provision for reforestation.

In addition to its own timber the company used timber from another source. The farmers in the neighboring region brought considerable amounts of their timber to the mill which was purchased at the prevailing market rate for the particular type of wood. This practice aided in the conservation of the company's supply of pulp wood.

The question arose as to the soundness of the company's policy of charging its own timber to process at cost. Obviously, the mill could have shown a handsome profit by using low cost wood, when, as a matter of fact, the manufacturing procedure might indicate that the mill was a high cost producer. This would lead to the conclusion that the mill could be on the margin from a production standpoint without this fact being detected, at least for a considerable length of time. If such a situation existed, the company would be better off in the lumbering business only. It was contended that the policy followed confused two entirely different things; first, the foresight and shrewd purchasing ability of the executives who fostered the purchase of the timber lands, and second, the aptitude and dexterity of the mill foremen, employees, and equipment, to produce at a reasonable cost. It was argued that these two factors were entirely different and that the accounting policy should have so indicated. It was also pointed out that it was impossible to compare the manufacturing status of the mill with other mills, since most other mills took a profit on timber as it was started in process. These matters were further complicated by the fact that the company had purchased some timber lands since the original purchase and had had to pay a higher price for them, which meant that there was a variation in the cost of timber in process depending upon which tract the timber was taken.

On the other hand, one or two of the executives felt that a great deal of this talk was useless since the company had to have timber to make pulp, which in turn was necessary to make paper. After all, they said, paper was the product that was sold and this was sold at prices established by competition, not by costs. This meant that selling prices were established by the marginal producer whose timber costs and manufacturing ability were such that it was just worth while for him to stay in the paper business. If the selling price was high enough to enable the Oxbow Company to show a profit, it all came from the activities involved in making paper, which included timber operations. It was, therefore, maintained, that to take a profit on wood was merely taking a portion of money out of one pocket and putting it into another with the sole result of adding an unnecessary complication to the accounting structure.

At what price should this company have charged pulp wood to the manufacturing department?

Should there have been any difference in the treatment of: the wood from the old timber tracts, that taken from those purchased more recently, and that purchased from the neighboring farmers? If so, how should each be treated? Why?

5. Sargent Manufacturing Company

STORES CONTROL: HOW SHOULD STORES QUANTITIES BE DETERMINED?

The accountant in charge of installing a scientific cost system in the factory of the Sargent Manufacturing Company, producers of pipes, fittings, and small tools, in 1922 was working on a method of determining the stores quantities for its various products. The procedure that he submitted for the approval of the management used the sales of each product for the previous four years as the basis for arriving at the quantity to be manufactured the following year. The record sheet which he designed for tabulating these figures had ten columns, four for the sales of the previous years, five for percentages, and one for a weighted average quantity. The sheet for the year 1922 would have the following headings:

1918	Per Cent	1919	Per Cent	1920	Per Cent	1921	Per Cent	Weighted Average Quantity	Per Cent

The two columns at the extreme right were for the weighted average quantity and the percentage of each size of the total in this quantity. The accountant proposed to allow the last years to have the greatest weight in estimating the future production; therefore, in the calculations for 1922, the sales figured for 1918 would be multiplied by one; for 1919, by two; for 1920, by three; and for 1921, by four; and the total would be divided by ten, which was a convenient figure to use in order to determine the weighted average quantity, column 9. After the weighted average quantity of each size was found, the percentage of the weighted average quantity of each size to the total of the weighted average quantities would be entered in column 10.

NOTE: "Quantity to Order" is Quantity of Sales During Production Period (Black), Or Quantity for Economic Run (Red).

BALANCE OF STORES QUANTITIES

Production Period ________ Item ________

	Size	Weighted Average Quantity	Unit Weight	Control Weight	Margin of Safety	Quantity to Order	Minimum	Maximum	Weighted Average Quantity	Unit Weight	Control Weight	Margin of Safety	Quantity to Order	Minimum	Maximum	
TOTAL ITEM CONTROL WEIGHT																

FORM 1.

ITEM	Date	Basic Minimum	Basic Quantity to Order	Date	Minimum	Quantity to Order	Date	Minimum	Quantity to Order	Group
										Lot Number
										Unit Weight
										Economy Run

ORDERED						RECEIVED		ISSUED			BALANCE ON HAND			APPLIED		AVAILABLE OR SHORTAGE
Date	Quantity	Order Number	Received	Previous	Balance Due	Quantity	Price	Quantity	Order Number	Date	Previous	Present	Price	Quantity	Order Number	

FORM 2.

From the figures determined by the method just described (Form 1), the balance-of-stores quantities were made out. The weighted average quantity was entered in column 2. The margin in column 5 was to allow for any unusual demand for a product. For example, if the weighted average quantity for a tool of a certain size was 1,200 per year, the average to be produced in one month would be 100; it might not be sufficient, however, to have only 100 made up each month with no reserve stock to cover unusual demands, and a margin of safety of, say, 50 might be established so that 150 would be made the first month and 100 each month thereafter in order that 50 always would be on hand as a reserve. As outlined by the accountant, the reserve stock in any case would not be more than 100% of the weighted average quantity for a production period. The Unit Weight and Control Weight in columns 3 and 4 were used, not for computation of minimum and maximum quantities, but for assistance in summarizing the different sizes for control purposes. On the greater part of the stock with large sales the reserve would amount to 25% of the weighted average quantity. This low reserve was believed possible because of the fact that the larger the number of sales the more evenly they probably would be distributed throughout the production period. The quantity to order for column 6, therefore, would be 150 for the first month, if there was no previous inventory on hand, and 100 for the following months. The planning department should bear in mind the quantity most economical to produce in setting the minimum and maximum quantities to order. From the balance-of-stores quantities in Form 1, the basic minimum of 150 in the illustration would be entered on Form 2. This Balance-of-Stores Card, Form 2, would be kept by a bookkeeping-machine operator in the general office who, besides making the entries on the cards, would note when the quantity available was approaching the basic minimum. If, for example, the basic minimum was 150 and the amount available was 155, the operator would fill out a notice of minimum to be forwarded to the order clerk in the planning department who would put through a production order.

The management was in some doubt as to whether it should accept the recommendations of its accountant, since the sales of two or three previous years would have no relation whatsoever to the sales of the next year, and the arithmetical computations recommended by the accountant could not be relied upon as a definite index for future production. Although several executives believed that the figures obtained by such a computation should be compared with estimates of probable sales submitted by the selling department, past experience had proved that the estimates of the selling department could not be relied upon to any extent. Since neither the arithmetical index of the accountant nor the estimates of the selling department would enable the management to make intelligent estimates of the quantities of each product to be manufactured for future periods, a different procedure should be adopted. Those who held this view recommended that future production should be determined by studying the business cycle. For example, if, after a study of the best business forecasting services, it was believed that a 15% improvement might be expected in the following year, 115% of the output of the current year should be produced in the next year. The application of this method at the beginning was advised for all products, but it was suggested that an executive keep in constant touch with the conditions of production and sales during the second year so that he would be in a position to advise concerning cases to which this method could not profitably be applied in the future.

Which method of determining stores quantities should the Sargent Manufacturing Company have adopted?

B. DIRECT LABOR COSTS

1. Grantwood Car Company

ACCOUNTING FOR LABOR COSTS: HOW NUMEROUS AND DETAILED SHOULD REPORTS ON LABOR COSTS BE?

DESCRIPTION OF COMPANY

Situated in the industrial section of a large eastern city, the Grantwood Car Company operated a plant which covered approximately 29 acres of ground and included a number of large buildings. The company did some manufacturing, but specialized in assembling cars for electric and steam railways, including passenger, supply, and crane cars, snow plows, car trucks, and miscellaneous equipment of a similar nature. In addition, quite a large volume of business was done in the form of repairs and production of parts for these products. Besides the parent plant there were four subsidiaries, three located at advantageous points in this country and one located in France. The nature of the work rendered the organization of the labor force and the keeping of labor costs of great importance. Control of the cost of labor at the plant was handled by a labor department under the supervision of a chief estimator who was also in charge of the cost estimates.

EMPLOYMENT REQUISITION

The company employed approximately 1,000 men, who had never become organized in a union, chiefly because the working conditions and treatment afforded them by the company had kept them satisfied.

Because of the scope of its work and the number of men employed, the employment department had developed an elaborate system of recording and checking the needs of the various departments. If a foreman, for instance, desired to hire more men, he had to requisition the employment department; he could do this by filling in an Employment Requisition (Form 1).

OFFICE RECORD, PHYSICAL EXAMINATION CARD, EMPLOYMENT CARD

Upon receipt of this requisition the employment department endeavored to fill the foreman's requirements from the available labor supply with which it was in contact. If the department employed a man, it made up three slips: the first, an Office Record (Form 2) giving various details about the man; the second, a Physical Examination Slip, which recorded the facts as disclosed by an examination made by the company's doctor; and the third, an Employment Slip, which was given to the employee to present to the shop clerk so that a Time Clock Card might be made out for him. The Physical Examination Slip, which was filed in the office, and the Employment Slip, which was retained by the shop clerk, contained the usual information and therefore are not reproduced here.

EMPLOYMENT REQUISITION

Date 19 No.

Please furnish for Dept.

Man	Woman	Nationality
Boy	Girl	

Position ☐ Temporary / Permanent

To increase force because

To replace Who { Was / Will be } ☐ Released / Transferred

A man in this position when accustomed to the work and our plant may expect to earn { Day work, per hour / Piece work, per hour / Monthly }

Remarks

Signed __________ Foreman Approved __________ Superintendent Received __________ Employment Manager

To Employment Office:

has been accepted for above position and began work

at A.M. / P.M 19

At the following rate per { Hour / Month }

Rate agreed to by __________ Employee

__________ Foreman

__________ Countersigned

Clock No. Signed by __________ Payroll clerk

Grantwood Car Co.

Form 1.

OFFICE EMPLOYMENT RECORD

Occupation: 1 2 Date of Application Name Age Race Address Birthplace*	Shop or Department	Number

How Long in U.S.A.	Citizen	1st Papers 2nd Papers	English Speak | Read | Write	What Other Language	Illit.	

Date of Birth	Single Married Widower	Number Children Under 16 Years	

Previous Employment (Last Place on Top)	How Long There	Kind of Work	Wages	Why Did You Leave?
Ever Employed Here? Date				

Mention Education, Training, Special Experience, or Limitations

Now Employed	How Long Since You Had Work?	Wages Salary } Expected

Applicant's Signature

Don't Fill Out Below This Line

Interviewer's Remarks:

Foreman's Acceptance	Why Rejected

* Give Town or City, State and County.

Grantwood Car Co.

FORM 2.

EMPLOYMENT RELEASE

If, for any reason, it was necessary to discharge a man, the foreman of the particular department filled out an Employment Release, in which he gave pertinent data regarding the employee and the cause of his release. Final action on the release was taken by the employment manager, the release, if approved, being filed with the other records the company had accumulated for this particular employee.

At the time the laborer was released, he turned in his Time Clock Card and number to the department clerk who computed the amount due him, and sent the record to the time department when the data were recorded. The Time Clock Record was then sent to the payroll department for payment, after which the man was fully released.

LABOR COST ESTIMATES

Labor costs at the Grantwood Car Company were based upon estimates which had been ascertained by building a sample standard product. For instance, the company had at one time constructed a standard gas-electric passenger and baggage car; the cost of each operation in the various departments involved was retained for use as the basis of future estimates for similar cars.

LABOR COST ESTIMATE

Grantwood Car Company	Date
Reference No.	Order No.

Mr.

Please note that your estimate in the Department

for Order No. is per unit.

Detail prices for labor sheets should be sent in as soon as possible and should not exceed this amount, otherwise they will not be approved.

Estimating Division

Per

Grantwood Car Co.

Form 3.

When variations from this standard car were specified in the orders, the costs for them were computed and added to the estimated standard cost, which enabled the company to furnish sound bids. Labor cost estimates were established on all the company's products in the same manner as the estimate had been determined on the gas-electric car.

When an order was received by the sales department, it was turned over to the estimating division, which obtained drawings and detailed specifications from the drawing room. With this detail the estimating department proceeded to send a memorandum (Form 3) to the foreman of each department, showing the labor allowance for that particular order in that particular department.

PRORATION OF ESTIMATE ALLOWANCE

Upon receipt of these Labor Allowance Memorandums, the foremen of the departments worked out in detail just how they expected to spend their appropriation for the job and then sent the information to the estimating department on either of the two following forms, depending upon whether the work was detail (Form 4) or assembly (Form 5).

PIECE-WORK PRICES—DETAIL WORK

No. of Units Kind

Recommended by______________ Dept. Date Order
Foreman

Item No.	Quantity per Unit	Name of Part—Blue Line Patt. or Dwg. No.—Red Line	Operations and Price Each Blue Line				Totals	
			Forge					
10–201	2 4	Bal. Top Plates 20 × 134	30 1.20					60

Grantwood Car Co.

Form 4.

PIECE WORK PRICES—ASSEMBLY WORK

No. of Units Kind For

Recommended by________________ Dept. Date Order

Foreman

Item No.	Quantity per Unit	Contract No.	Operation	Price Each	Price per Unit	Total for Order

Grantwood Car Co.

Form 5.

LABOR COST SHEETS

When the foregoing forms were received by the estimating department, Labor Cost Sheets (Form 6) were typed and sent to the various departments, showing each operation, number of pieces, price for each and the total cost of labor for the operation. The Labor Cost Control Sheet contained columns giving the date the operation was performed, the clock card number of the man performing it, number of hours worked, number of pieces finished, and the total wages. Entries were made in these columns at the close of each day by the department clerk, who obtained the information from the employees' Work Card. Labor Cost Sheets for sundry orders were similar to the large car order Labor Cost Sheets.

In addition to the Labor Cost Sheet, a Unit Labor Cost Sheet (Form 7) was prepared for each order.

In the column headed "Labor per Unit" were included the original departmental allowance estimates prepared from the specifications and drawings, the total being the estimated cost of a completed unit. In the second column appeared the actual cost of the completed operations of each department on the particular order. As the order progressed from department to department, the actual costs were totaled in pencil. Although

<table>
<tr><td colspan="20">LABOR COST SHEET</td></tr>
<tr><td colspan="5">Sheet No. Smith</td><td colspan="5">Order Issued</td><td colspan="5">Order Completed</td><td colspan="5">Order No. 22710</td></tr>
<tr><td colspan="5">Item No. 10–20 Dwg. No. 20×134</td><td colspan="5">Item No. Dwg. No.</td><td colspan="5">Item No. Dwg. No.</td><td colspan="5">Item No. Dwg. No.</td></tr>
<tr><td colspan="5">Part Bolster Top Plate</td><td colspan="5">Part</td><td colspan="5">Part</td><td colspan="5">Part</td></tr>
<tr><td colspan="5">Oper. Forge</td><td colspan="5">Oper.</td><td colspan="5">Oper.</td><td colspan="5">Oper.</td></tr>
<tr><td colspan="5">Pcs. 4 @ 30 Total 1.20</td><td colspan="5">Pcs. @ Total</td><td colspan="5">Pcs. @ Total</td><td colspan="5">Pcs. @ Total</td></tr>
<tr><td>Date</td><td>Man No.</td><td>Hours</td><td>No. Pcs.</td><td>Wages</td><td>Date</td><td>Man No.</td><td>Hours</td><td>No. Pcs.</td><td>Wages</td><td>Date</td><td>Man No.</td><td>Hours</td><td>No. Pcs.</td><td>Wages</td><td>Date</td><td>Man No.</td><td>Hours</td><td>No. Pcs.</td><td>Wages</td></tr>
<tr><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td></tr>
</table>

Grantwood Car Co.

FORM 6.

UNIT LABOR COST SHEET

Labor Department

Quantity
Purchaser
Type
Order No.
Est. No.
Ref. No.
Date

Department	Labor per Unit				
Forge Press					Engineering
Smith					
Steel Preparation					Boxing { Knocked Down
Spring					
Press Metal					Boxing { Boxed Whole
Sheet Metal					
Truck					
Bolt Room					
Brass Finishing					
Machine					
Seat Metal					
Seat Upholstering					
Steel Car Erecting					
Sand Blast					
Wood Mill					
Cabinet					
Wood Erecting					
Finishing					
Electrical					
Upholstering					
Paint					
Varnish					
Laborers					
Packing					
Heat Treating					
Repair					
Automotive Assembly					
Mill No. 2					
Elevator No. 99					
Totals					

Grantwood Car Co.

Form 7.

the actual cost in the second column for a particular department might be greater or less than the estimated allowance in that department, the total actual cost for the entire job usually varied but slightly from the total estimated allowance for the job. Any discrepancy appearing between these totals, however, had to be explained to the general manager by the chief estimator.

The estimated labor costs for each order were reviewed by the plant superintendent and after meeting his approval, work was authorized to begin; the progress of each order was under his constant supervision and any changes or excesses were reported to him.

VARIATIONS FROM ESTIMATES

If, in the course of operations, a department foreman found that his estimate for a particular operation was too low or too high and that a change was necessary, he filled out a Daily Change Sheet (Form 8) giving the old price for the operation, the new price and the total for the order, and sent it to the estimating department for approval. If the change in price was found to be necessary and unavoidable it was authorized and the Labor Cost Sheets changed accordingly.

DAILY CHANGE SHEET

No. of Units Order No.

Recommended by____________________ Dept. Date
Foreman

Item No.	Total Quantity	Contract No.	Name of Part	Operation	Old Price	New Price	Total for Order
	4				30	40	40

Grantwood Car Co.

FORM 8.

The estimating department experienced a few minor difficulties at times. Foremen frequently reported that their original estimates had to be changed because of fluctuating wages. This was a recognized condition, but the estimating system used by the company was sufficiently flexible to enable such changes to be made without serious disruption of the production scheme. Costs sometimes exceeded estimates because of external conditions and leakages over which the estimating department had no control.

ACCUMULATION OF COSTS

When all necessary forms were in the hands of the estimating department, when Labor Cost Sheets for a job had been sent to the various departments interested, and the work had been authorized, the actual accumulation of costs began. Time Cards like the following (Forms 9 and 10) were made out by each workman for each job.

At the end of the day, the workman turned in all of his Work

DAY WORK CARD

Stopped

Date

Man No.

Mach. No.

Order No.

Started

Helpers' Numbers

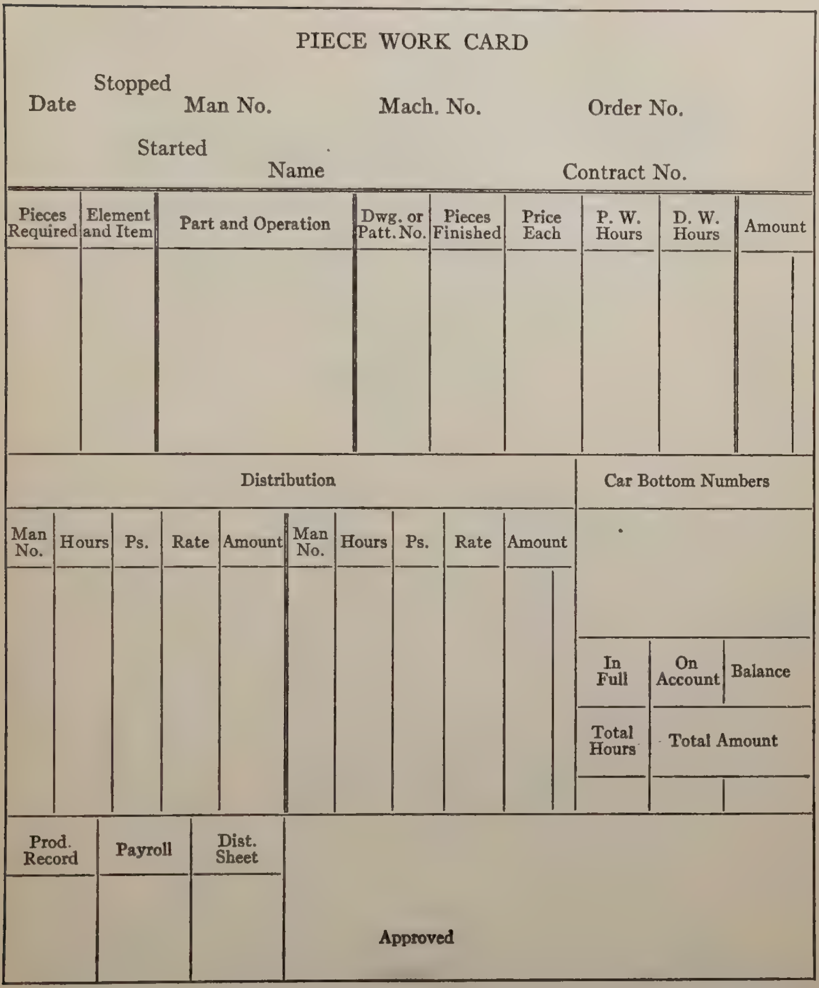
Name

Element and Item	Part and Operation	Dwg. or Patt. No.	Pieces Finished	Price Each	P. W. Hours	D. W. Hours	Amount

Prod. Record	Payroll	Dist. Sheet	
			Approved

Form 9.

Grantwood Car Co.



PIECE WORK CARD

Date
Stopped
Started
Man No.
Name
Mach. No.
Order No.
Contract No.

Pieces Required	Element and Item	Part and Operation	Dwg. or Patt. No.	Pieces Finished	Price Each	P. W. Hours	D. W. Hours	Amount

Distribution

Man No.	Hours	Ps.	Rate	Amount	Man No.	Hours	Ps.	Rate	Amount

Car Bottom Numbers

In Full	On Account	Balance
Total Hours	Total Amount	

Prod. Record	Payroll	Dist. Sheet

Approved

Grantwood Car Co.

Form 10.

Cards to the department clerk, who checked the figures, extended the totals on the Work Card, posted the amounts to the proper operation on the Labor Cost Sheet, and noted that the prices paid for the operations were in accordance with the allowances previously typed on the Labor Sheet by the labor department. After the cards were signed by the foreman, the department clerk forwarded the Work Cards to the payroll department. In the latter department the Time Cards were filed in card envelopes which were indexed according to day work and piece work, by department name, and by man number. The accumulation of these Time Cards continued until the end of the payroll period at which time they were checked with the workman's Time Clock Record, the total of which appeared on his Payroll Card (Form 11).

PAYROLL CARD

Name	Department	Key No.
Rate	Occupation	

ATTENDANCE—CLOCK RECORD

Week No.	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26
Sun. Mon. Tues. Wed. Thu. Fri. Sat.																										
Total																										

Week No.	Week Ending	P. W. Hours	D.W. Hours	Total Hours	P. W. Earnings	D. W. Earnings	Total Earnings	Remarks
1								
2								
3								
4								
5								
6								

Grantwood Car Co.

FORM 11.

(Reverse side contains remaining 26 weeks in year.)

These Payroll Cards covered a year's time. The workman's daily time was posted to them from the Time Clock Cards and totaled at the end of each payroll period. The total hours worked were carried to the column marked "P. W. Hours" and "D. W. Hours," according to the nature of the work at which the man was employed. If he was on piece work, the rate, number of pieces finished, and total amount as shown by his

Piece Work Card reproduced above supplied his piece work earnings for the period which was entered on the Payroll card in the column headed "P. W. Earnings."

From the information given on the Work Cards and the Payroll Cards the paymaster's department made up the payroll. Daily labor expenditures by departments were kept currently on all important orders and given to the superintendents each day for review. The Labor Total Sheet (Form 12) was used to show department allowances and as a Summary and Control Sheet for labor expenses as recorded in the Labor Cost Sheets.

LABOR TOTAL SHEET

Quantity Kind Order No. Sheet No.

For

Labor Dept. Total Stock Orders Time Dept. Allow.			Labor Dept. Total Stock Orders Time Dept. Allow.			Labor Dept. Total Stock Orders Time Dept. Allow.		
Pay Ending	Amount	Total to Date	Pay Ending	Amount	Total to Date	Pay Ending	Amount	Total to Date

Grantwood Car Co.

FORM 12.

As soon as the payroll department finished making up the payroll, the Work Cards were released to the distribution department, which distributed labor expense to the various Work in Process accounts. The labor cost for each order was entered on a Weekly Labor Distribution Sheet (Form 13) from the Work Cards; these distribution sheets were used to accumulate labor for one week by departments for each order.

Form 12 contained six sets of columns in the original, of which only three sets are shown here; the original of Form 13 contained four sets of columns.

WEEKLY LABOR DISTRIBUTION SHEET

Dept. Date Order No.

Date	Man No.	Hours	Wages	Date	Man No.	Hours	Wages	Date	Man No.	Hours	Wages

Hours Wages I. F. E.

Grantwood Car Co.

Form 13.

From these Labor Distribution Sheets, the overhead rate applicable to each department was worked out, so that when the distribution sheet totals were charged to the various Work in Process orders, both labor and overhead were charged at the same time.

The Weekly Labor Distribution Sheets were totaled and collected by departments for each order, thence they were posted to a Monthly Summary Sheet (Form 14) for each order showing direct labor and burden which were charged to the Work in Process Control account at the end of each month by vouchers put through the controlling ledgers for the month's total. In this manner the detail records were in accordance with the controlling accounts covering the same classes of orders.

At the same time the labor and burden were distributed to the Work in Process orders, the amounts were also posted to the following Summary Cost Sheet (Form 15) which was to be used in the office.

For purposes of comparison by the management, a sheet was prepared (Form 16) showing the amount of the payroll for both productive and nonproductive labor.

The upper portion was reserved for payroll of productive labor, while the lower portion was for nonproductive labor payroll totals. Nonproductive labor was handled similarly to

MONTHLY SUMMARY

Direct Labor and Burden Charges to W-in-P Orders—Cars and Trucks

Order No.

Month

Pay Ending													
Department	Hours	Amount	Hours	Amount	Hours	Amount	Hours	Amount	Hours	Amount	Total Hours	Total Amount	Total Burden
Forge													
Blacksmith													
Bolt Room													
Brass Finishing													
Steel Preparation													
Steel Car Erecting													
Press Metal													
Spring													
Truck													
Seat Metal													
Sheet Metal													
Machine No. 1													
Die													
Heat Treating													
Sand Blast													
Pipe and Repair													
Wood Mill													
Wood Mill No. 2													
Bending													
Cabinet													
Cabinet El. No. 99													
Wood Erecting													
Finishing													
Paint													
Varnish													
Electrical													
Seat Upholstering													
Upholstering													
Loading-Packing													
Automotive Car Assembly													
Automotive Car Drafting													
Drawing Room													
West Yard													
Total													

Grantwood Car Co.

FORM 14.

SUMMARY COST SHEET

Description
Order Entered
Order No.
Final Shipment
Customer
Cost Completed
Labor and Burden Costs

Pay Ending																Total	
	Hours	Labor	Burden	Hours	Labor	Burden	Hours	Labor	Burden	Hours	Labor	Burden	Hours	Labor	Burden	Hours	Labor	Burden

Labor Transfers						Debits						Balance; Credits				
Date	Order No.	Department	Hours	Labor	Burden	Month	Hours	Labor	Burden	Material	Total	Debit—Black Credit—Red	Date	Shipping Memo. No.	Quantity	Amount

Grantwood Car Co.

FORM 15.

LABOR COMPARISONS						
Productive Department	Pay Ending		Pay Ending		Total	
	Hours	Amount	Hours	Amount	Hours	Amount
Cars and Trucks:						
Regular						
Automotive						
Sundries:						
Regular						
Automotive						
Seats						
Spring a/c						
Brass M'l'g a/c						
Stock Parts						
Regular						
Automotive						
E. & O. & G. Sundries:						
Regular						
Automotive						
Pattern a/c						
Factory Orders "C"						
Total						
Factory Orders "Exp."						
Shop Orders:						
A-Regular						
XA-Automotive						
Acct. No.						
Nonproductive						
Total Payroll						

Grantwood Car Co.

FORM 16.

productive labor as already described, labor cards being obtained by the men and filled out in much the same manner as those for productive labor. Most of the nonproductive labor was on an hourly basis, the controller estimating that of the 25% of labor or day work, practically all was nonproductive. The remaining 75% was on piece work and was generally productive.

Could the Grantwood Car Company have curtailed its clerical work relative to labor and at the same time have retained as adequate information as it had?

What would you consider to be the principal objects of the records for labor, in terms of the administration of the business?

2. Volga Shipbuilding Company

LABOR COST CHARTS: HOW CAN A FIRM KEEP A RUNNING CHECK ON ITS LABOR COSTS?

The shipbuilding industry had been experiencing a depression since 1920, and the Volga Shipbuilding Company, operating as a part of the industry, had difficulty in securing sufficient orders to keep its plant and labor force reasonably employed. Labor, of all the elements involved, was the most important, because a high degree of skill was necessary, and the greatest cost variations usually occurred with this item of cost. Since business was poor, the company desired to schedule its work and bid for contracts so that it could utilize its labor force most efficiently and in such a manner that the number of employees would not vary because of peak and slack loads in the work. In order to assist in accomplishing this the company began to keep three charts: Chart 1 showed a Block Forecast and Actual Direct Labor per Week; Chart 2 was a Weekly Labor Chart by Classes of Products; and Chart 3 was a Cumulative Chart of Whole Cost.

The area under the dotted line on Chart 1 represented the total direct labor for Job 621, which was a passenger vessel, as estimated at the time the contract was received. The line indicated roughly the amount which would probably be spent weekly for labor during the progress of the work; this estimate of labor cost per week was worked out from accounting data on past jobs of a similar character. Due consideration was given to the general particulars of the job as to size and type, new design, or a duplicate or modification of a previous design, conditions of other work on hand, and time limits in contract for completion.

The solid line was plotted as the work progressed and indicated the actual direct labor expended on Job 621. The ordinate points were plotted at the end of each month and showed the average amount of labor per week for the month. As shown on the chart, some months consisted of four weekly periods, while others consisted of five. The solid line, in order to be comparable with the forecast line, was plotted to the same scale and on the same chart as the forecast diagram.

The purpose of the chart was twofold. First, the forecast diagram provided a block outline of the weekly volume of direct labor for a job, which could be combined with similar diagrams for other jobs in hand to form another diagram (Chart 2) to give a total upon which to predict the total labor force required for several months ahead. Second, the curve of actual labor afforded an opportunity for accumulating a body of experience for use in forecasting the labor expenditures on additional jobs as they were booked.

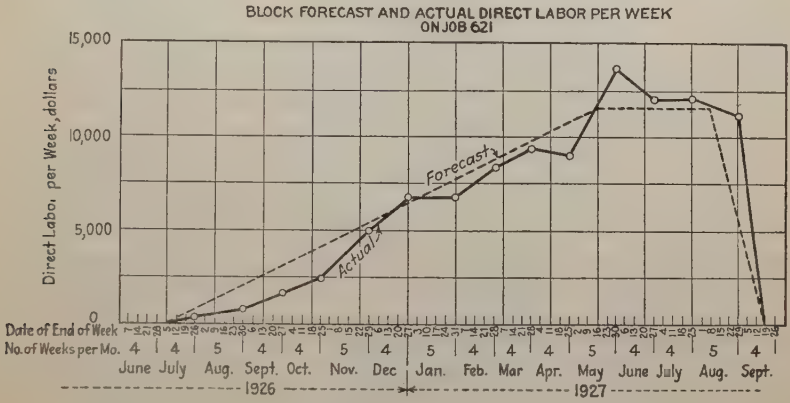


CHART 1.

Obviously, in order to get the total direct labor cost per week the amount expended on each job had to be accumulated. This was done by superimposing all the individual charts like Chart 1 for Job 621 in cumulative fashion upon Chart 2, which thus showed the total direct labor expended for all jobs on hand and upon which were also shown forecasts of total labor ahead by weeks for all classes of work. Chart 2 indicates that Job

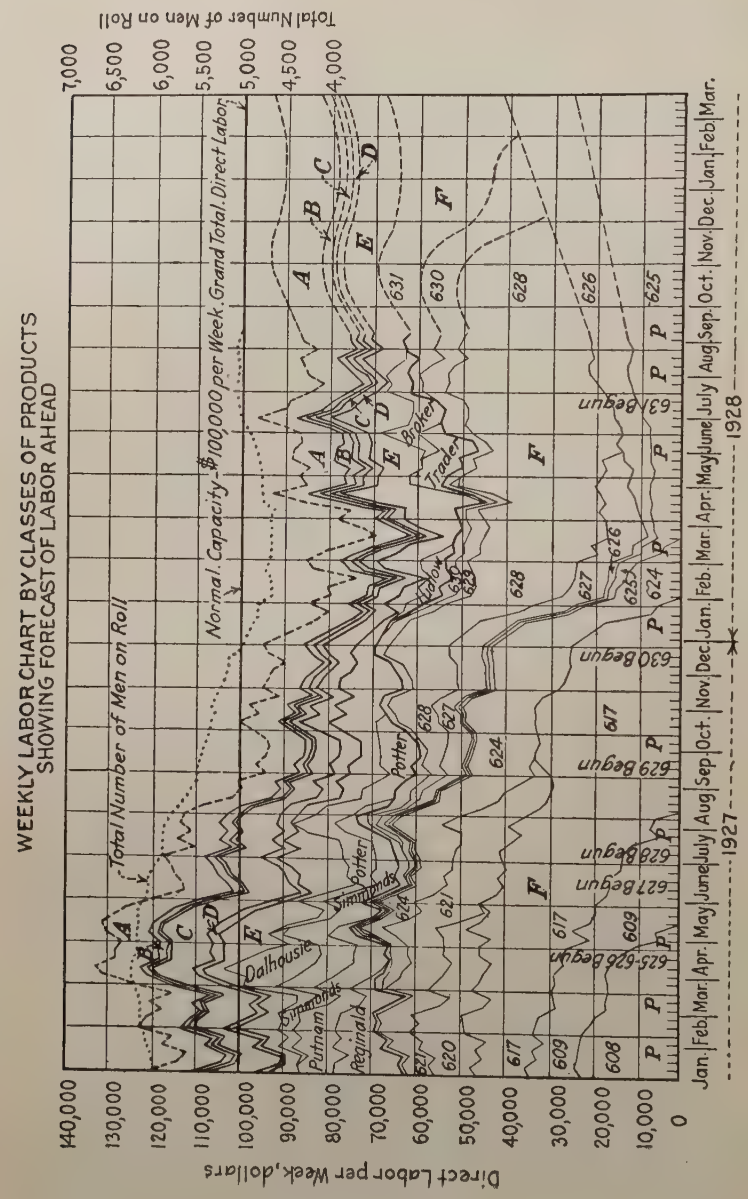

WEEKLY LABOR CHART BY CLASSES OF PRODUCTS
SHOWING FORECAST OF LABOR AHEAD
Total Number of Men on Roll
7,000
6,500
6,000
5,500
5,000
4,500
4,000
Direct Labor per Week, dollars
140,000
130,000
120,000
110,000
100,000
90,000
80,000
70,000
60,000
50,000
40,000
30,000
20,000
10,000
0
Total Number of Men on Roll
Normal. Capacity $100,000 per Week. Grand Total. Direct Labor
A
B
C
D
E
F
P
Dalhousie
Simmonds
Putnam
Reginald
Potter
Simmonds
624
621
620
617
609
608
621
Potter
628
627
624
617
Hollow
630
629
628
627
626
625
624
Broker
Trader
631
630
628
626
625
625-626 Begun
627 Begun
628 Begun
629 Begun
630 Begun
631 Begun
Jan. Feb. Mar. Apr. May June July Aug. Sep. Oct. Nov. Dec. Jan. Feb. Mar. Apr. May June July Aug. Sep. Oct. Nov. Dec. Jan. Feb. Mar.
1927
1928

CHART 2.

621 had been started before January, 1927; if the prior Chart 2, of which the Chart 2 presented is a continuation, were available, it would be seen that Job 621 was begun on July 5, 1926, as shown in Chart 1. It can be seen that the completion date for this job was September 19, 1927, as indicated on both Chart 1 and Chart 2. This merely makes it clear that Chart 2 was made by superimposing on it all the charts like Chart 1 which were for individual jobs. Small jobs were not shown separately but were summarized in totals by groups from past records and from prospects for the immediate future.

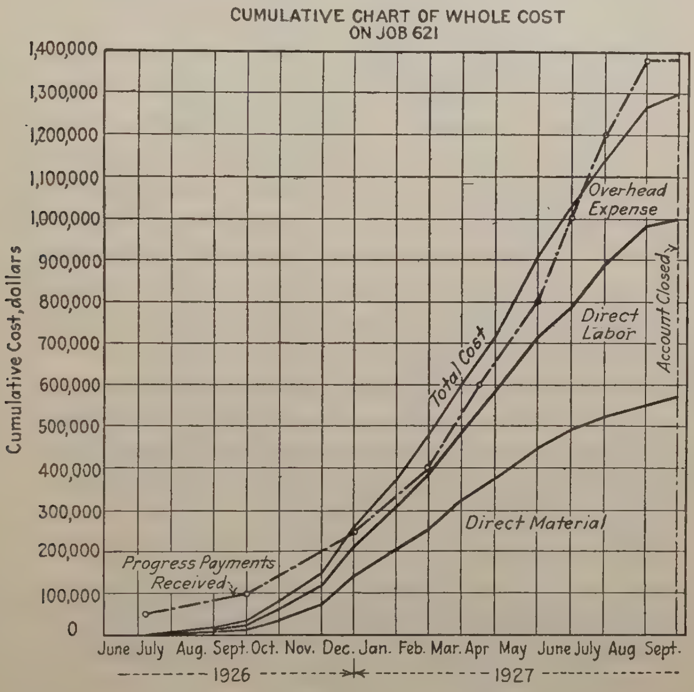


CHART 3.

The purpose of Chart 2 was to show a general and continuous review of past volume of labor activities in totals and by classes of products together with a forecast of future activities for jobs in course of construction. It was a master chart which was used, on the one hand, to determine the most advantageous position in the work program for taking on additional contracts, and, on the other hand, to provide means of determining six months or more ahead of time the critical periods of congestion in labor requirements. Analysis of these critical periods by trades in the respective operative departments gave a basis upon which to regulate the production schedules to avoid, as far as possible, peak and slack loads in meeting the delivery dates.

Chart 3 differed from Charts 1 and 2 in that it showed in cumulative form the monthly progress of the whole cost for Job 621 and the money received for same, whereas the others dealt only with the volume of work as represented by direct labor. In Chart 3 the direct labor was superimposed upon the cost of material, and the overhead expense at normal costing rate was superimposed upon the totals of labor and material. As can be observed, the forecast lines did not appear on the final charts. They were, however, shown on the working sheets or rough charts but were erased as the actual costs and payments became available because they were found confusing and unnecessary on the final chart.

The purpose of Chart 3 was to show the progress of total cost on a job in comparison with estimates and with progress payments received from the customer. The summation of all charts in this form gave a forecast of total receipts and expenditures for all jobs on hand.

Do you believe that charts similar to those used by the Volga Shipbuilding Company could be used in a manufacturing concern where there were many departments, and a large variety of products produced?

Is there any further step the company might have taken in its Chart 2 that might have had great advantages?

What individuals or groups of individuals in the company do you presume would be most interested in these charts?

Compare this case with the Eastern Rubber Company case.

3. Gamage and Vickers

PAYROLL PROCEDURE: WHAT RECORDS ARE NECESSARY IN THE PAYROLL PROCEDURE OF A SMALL COMPANY, AND HOW SHOULD THEY BE HANDLED?

In the firm of Gamage and Vickers about 100 employees, mostly girls, were regularly employed in the seven departments of the shop. The majority of these workers were paid on an hourly basis; a few, however, were on piece work, and one department had some employees working under a bonus system.

APPLICATION

Position Wanted Date
Name Nationality Age
Address Date Naturalized Tel. No.
Date First Papers

Single	Married	Widower	Number in Family	Trade or Occupation

Previous Record

Employed by	Position	Date (from)	Date (to)	Salary	Refer to

Other References
Remarks

Gamage and Vickers

Form 1.

When people came to the company seeking employment, they filled out Application Forms (Form 1), which were filed away by the factory superintendent, who personally engaged all new employees; when new workers were required, these applications were referred to and a selection made. On the reverse side of the Application Form was an Employee Record (Form 2) which was filled in by the factory superintendent when a person was engaged; this form gave the name, address, clock number assigned, department in which the person was to work, and her rate of pay. This record was forwarded to the payroll clerk as notification of the hiring of a new employee. She entered the name and number on the Payroll Record and then filed the card away by clock number.

When he changed the rate of pay of employees, the superintendent verbally notified the payroll clerk, who entered the

EMPLOYEE RECORD

Name No.
Address Telephone No.
Address Telephone No.
Address Telephone No.
Employed by

Date	Position	Salary	Per	Date	Position	Salary	Per

Date Left Date Discharged
Record and Remarks

Form .

Gamage and Vickers

change, the date, and the person authorizing it on the record card. When employees left the company, the record cards were withdrawn, the date of leaving was entered, and the cards were placed in an inactive file. No entry was made recording the performance of employees while they were with the concern.

All employees were required to ring in and out on a mechanical time clock, and they were each furnished with a card (Form 3) on which to record their time for a week's period. These cards were then collected and taken to the payroll clerk, who totaled the number of hours worked, after which she made up the Payroll Sheet, on which were recorded the employee's name, number, hours worked, rate, and earnings. The Time Cards were filed for a few weeks and then destroyed. In the case of employees working under piece or bonus rates, the amount of production completed by each one was reported to the payroll

GAMAGE AND VICKERS

Week Ending 19

No.

Name

DAY WORK

Day	Morning		Afternoon		Lost or Overtime		Total
	In	Out	In	Out	In	Out	
Monday Tuesday Wednesday Thursday Friday Saturday Sunday							

Day Work Hours

Piece Work

Total Wages for Week

Gamage and Vickers

FORM 3.

clerk by their respective foremen. The Weekly Payroll Sheets were finally bound in a volume which served as the permanent record of wages paid.

In making up the Payroll Sheet, the employees' names were entered by clock numbers, and their clock numbers were so grouped that each division of the list contained the employees of a single department; by sub-totaling the different groups, the labor charge for each department was obtained. A cumulative record of earnings of each employee had once been kept for the purpose of making up the required Federal Income Tax Department Report, but this procedure had been discontinued when it was found that so few of the workers earned an amount sufficient to require that it be reported; it was easier to summarize the necessary data at the end of the year.

The company paid its employees by checks which were of a special form carrying the notation "Not over $100." The name and amount were entered by hand on the check and stub, after which the amount was also filled in by a check protector, and the checks signed by the cashier. Other checks issued by the firm had to be signed by one of its officers, but both forms were cashed against the regular bank account. The checks were placed in regular payroll envelopes and passed out to the employees.

In reviewing the payroll procedure the consultants believed that the system was adequate and accurate for the purposes of the company. They did, however, offer some suggestions as to the simplification of the work.

They first recommended that the practice of making out check stubs for the payroll checks be discontinued. In place of this record they believed that placing the employee number on each check drawn and entering the check number on the Payroll Sheet would be all that was required; this procedure would make the Payroll Sheet a complete record. They also suggested that the use of the payroll envelope be discontinued; this change would save clerical labor and was in accord with the practice followed by firms which paid by check. In the matter of the distribution of labor charges to departments, the consultants believed that the present information obtained was of little value, as no attempt was made to record the transfers of indi-

EMPLOYEE TIME REPORT

Name

No.

Date

Job No.	Description	Time	Operation	Quantity
		7:30		
		7:45		
		8:00		
		8:15		
		8:30		
		8:45		
		9:00		
		9:15		
		9:30		
		9:45		
		10:00		
		10:15		
		10:30		
		10:45		
		11:00		
		11:15		
		11:30		
		11:45		
		12:00		

If working during lunch period state so in this space.

		12:30		
		12:45		
		1:00		
		1:15		
		1:30		
		1:45		
		2:00		
		2:15		
		2:30		
		2:45		
		3:00		
		3:15		
		3:30		
		3:45		
		4:00		
		4:15		
		4:30		
		4:45		
		5:00		

All reports must be approved by foreman.
Use reverse side for overtime.

Approved by ____________________
Foreman

Gamage and Vickers

FORM 4.

PAYROLL COLLECTION SHEET

Month of Employee No.

Weeks Ending 192 Department Rate

Date	Day	Direct		Indirect		Direct		Indirect		Direct		Indirect		Total Hours	Day-work Wages	Piece-work Wages	Total Wages
		Hours	Amount	Hours	Amount	Hours	Amount	Hours	Amount	Hours	Amount	Hours	Amount				

Gamage and Vickers

FORM 5.

For Week Ending

PAYROLL

Clock No.	Name	Day Record						Distribution											
		Rate	Hours	Earning	Adjustments	Paid		Box				Envelope				Paper			
						Amount	Check No.	Direct		Indirect		Direct		Indirect		Direct		Indirect	
								Hours	Amount	Hours	Amount	Hours	Amount	Hours	Amount	Hours	Amount	Hours	Amount

Distribution																	
Engraving				Printing				Assembly				Stock		Shipping		General	
Direct		Indirect		Direct		Indirect		Direct		Indirect							
Hours	Amount	Hours	Amount	Hours	Amount	Hours	Amount	Hours	Amount	Hours	Amount	Hours	Amount	Hours	Amount	Hours	Amount

Gamage and Vickers

FORM 6.

viduals from one department to another. Forms 4, 5, and 6 were therefore suggested by the consultants as being necessary to complete the cost accounting work.

Would you recommend the adoption of the suggested new payroll forms?

4. Davis, Williams and Company

PAYROLL RECORDS: HOW MAY PAYROLL RECORDS BEST BE ORGANIZED FOR SAFETY AND ECONOMY IN HANDLING?

Davis, Williams and Company manufactured a patent medicine put up in tablet form and sold retail in small packages at 10 cents a package. In the making department, all employees were paid an hourly rate, and the same was true of all indirect labor; the only exception was the packing department, where piece rates prevailed. Payroll work was handled by the factory superintendent's office, the foreman of the packing department, and the bookkeeper.

Thursday evening was the close of the pay period; the superintendent then checked over the Clock Cards (Form 1), noting especially, in the case of transfers of employees from their regular jobs, the account to which that time should be charged. Packers' wages were computed from a daily record kept by the foreman of that department, showing the quantity packed by each employee. This information was passed on to the bookkeeper, in the form of individual records (Form 2) which, after being noted on the Payroll Cards, were put in the pay envelopes, to enable employees to check up their earnings.

The Payroll Record consisted of one card for each employee, arranged to formulate a year's earnings (Form 3); the cards were filed according to the account numbers to which they were regularly charged, namely, Factory Labor, Packing, Shipping, Drivers, Indirect, Superintendent and Foreman, and Office. For employees on the hourly basis, the bookkeeper entered the hours shown on the Clock Cards on the left side of the Payroll Card, and extended them to the right at the hourly rate. Transferred time was figured on a Memorandum Transfer Sheet, a double-column sheet with a section for each account.

The company had a special bonus plan under which a bonus certificate of $50 was given to every employee who had completed 50 weeks of service (which did not need to be consecutive) without being absent or late. For each week of perfect record, he was credited with $1, and these credits were accumulated in red on the Payroll Cards, but were valueless to the employee until they totaled $50, when a certificate was issued, redeemable in cash at any time, and bearing 8% interest while current.

A Payroll Voucher (Form 4) was then made out by totaling the Payroll Cards, including bonuses, under the several account headings, making allowances for transfers, and deducting the bonuses

EMPLOYEE CLOCK CARD

No.

Name

Pay Ending

Morning		Afternoon		Overtime		Hours
In	Out	In	Out	In	Out	

Regular Time Hours Rate

Overtime

Total Amount

Davis, Williams and Co.

Form 1.

PIECE-WORK REPORT

Packing Dept.

Pay Sheet for

Friday
Saturday
Monday
Tuesday
Wednesday
Thursday

Total

Total for Week

Week Ending

Davis, Williams and Co.

FORM 2.

PAYROLL RECORD

Name Address No. Date				Distribution Rate Date	
19— January February March April May June					

Davis, Williams and Co.

FORM 3.

from the total of the voucher. The bonuses were credited to a Bonus Accrued account, to which bonus certificates were charged when issued.

Employees were paid by cash, and their pay envelopes were made up from their Payroll Cards. When the envelopes had been totaled and balanced with the Payroll Voucher, the packer reports were inserted in their envelopes. A list of the necessary

PAYROLL VOUCHER

Co. Name

Payroll of

Factory Labor Packing Indirect Drivers Shipping Department Labor Foremen Office		
Amount of Voucher Bonus Amount of Check		

Davis, Williams and Co.

FORM 4.

currency denominations was made up from the envelopes, a check was drawn and cashed by the treasurer, and the envelopes filled by the bookkeeper. Employees were paid each Friday afternoon for earnings up to the night before, so that all payroll work was completed on the Friday morning.

During a discussion among the officials of the company, several suggestions were made concerning this procedure. It was considered unwise to have the same person, the bookkeeper, solely responsible for computing the pay amounts and filling the envelopes with no automatic check on his work. The treasurer made occasional test checks of various parts of this work, but there was no regular provision for such checks. It was suggested that the compilation of the payroll should be done by a different person from the one handling the cash, there being enough of an office staff to make this possible. A clerk could make up the payroll in its various stages, under the supervision of the treasurer, and the bookkeeper could handle the cash. Against this it was argued that the office payroll was handled by the same procedure as the factory payroll; it was the desirability of keeping this confidential which had led to leaving all this work in sole charge of the bookkeeper. To meet this situation, it was proposed that the office payroll might be separately handled by the treasurer personally; a card representing the total of this portion of the payroll could be included in the regular records to enable the total of the payroll to be secured.

Comment was also made on the fact that the separate cards were the only permanent complete Payroll Record, and that a card might easily be lost or replaced by another one. To meet this, it was suggested that a permanent weekly record be made by simply adding the employee numbers to the adding machine tape on which the amounts were listed when checking the envelopes with the voucher.

The question of paying employees by check was also discussed. It was claimed that this method had the advantage of (1) eliminating hold-up dangers, (2) eliminating all temptation to dishonesty on the part of payroll clerks, (3) reducing clerical work, as the writing of checks would eliminate the writing of envelopes, figuring denominations, counting money, and filling envelopes, (4) providing receipts through the return of the canceled checks.

What do you think should have been done about the matters criticized?

Is it desirable or necessary to have the Payroll Record both in card index form and in list or roll form?

5. Speedster Automobile Corporation

WAGE PAYMENT: WHAT RESULTS SHOULD BE EXPECTED FROM THE INTRODUCTION OF AN INCENTIVE SYSTEM OF WAGE PAYMENT?

The Speedster Automobile Corporation was one of the smaller manufacturers of pleasure cars located in the Middle West. It had been established for many years and, for the most part, the executives had been connected with the company since its formation. For this reason, they had been able to watch the development of the industry since its infancy and it had been their object at all times to keep their plant in line with all improvements in methods of manufacture that had taken place. Through the introduction of both specialized machinery and job specialization, they had seen the direct labor costs diminish in recent years from a large percentage of the total cost of the finished product to about only 10% of that cost. Likewise, as a result of this situation, they had seen the adoption in many automobile plants of one sort of incentive wage system or another. This company, however, although it had considered such a procedure, had never attempted to initiate one, feeling that their labor costs were as low as those of any company and that, consequently, little would be gained.

Bearing in mind the close relationship between direct labor cost per unit produced and overhead charges to that unit which depended upon the efficiency to which a machine was used, and also the growing intensity of competition in the market for automobiles, the executives again brought up the question of whether or not to introduce an incentive wage system. Costs had to be reduced and they felt that this new relationship in amount of direct labor and machinery used, opened a possibility of some reduction in costs under a new system of labor control. An investigation was accordingly undertaken.

When the report was rendered to the executives, it showed them one thing conclusively, namely, that the nature of the tasks performed in their plant was such that a group system of incentive wage might be applied if they felt it advisable. Each piece was usually worked upon by several men performing the same or slightly varied operations and, although it would not have been practical to determine the actual output of each man, it was possible to find the group output. In this way, therefore, by applying the group output to a base rate for each man, he could be given a bonus proportionate to his efficiency. Foremen could be paid a bonus under the same plan according to the total production of those under them. They agreed, too, that the large investment in machinery was a factor strongly in favor of some such plan. However, some held that everything considered the plan would not be advisable in this case.

For example, the personnel manager, who held a position of great influence in this concern, was one of the chief objectors to the introduction of the system. He claimed in the first place that any such change might cause labor troubles which could not be readily settled. At that time he was able to obtain good labor as men in the district desired to work for this company, No other company had an incentive system in that city. He felt that the difficulty of setting the proper standards and rates would be too great and the dangers resulting from incorrectly setting standards would be impossible to rectify without causing labor troubles. It had been his experience, too, that in this industry changes took place so rapidly that new standards would have to be set repeatedly. Also, he said there was danger of injuring the quality of the products that had always held a reputation for fine workmanship. On the whole, his views were that the working force was industrious and that the savings made through an incentive scheme would not compensate for the high cost of installation and operation, especially when such procedure placed the quality of the goods and the goodwill of the labor force in jeopardy.

The cost accountant disagreed with this man. In his opinion most of these difficulties would be done away with through the use of accurate time studies and tact in handling the situation. The plan, to his mind, would allow this company to have the pick of the best workers rather than be the cause of labor troubles since their individual efficiency was to be taken into consideration. As to quality, he said that inspectors would insure a standard and that those men would be receiving the best training possible to become foremen later on. He knew that tasks and standards would have to be changed often but claimed that the cost data offered by this system would act as a guide in making them correctly. To him, one of the chief values of such a system was in the control it would offer to the production manager. A so-called Control Sheet could be worked out each week. This would account for every minute of the working day for every group in the factory and express this time in terms of the productive labor cost per unit it produced, the non-productive labor cost per unit and the waste labor cost per unit. Along with the Control Sheet, a Work Sheet would go to the executives. This Work Sheet would be an explanation of every unproductive minute shown upon the Control Sheet, telling why time was lost and setting the responsibility for such loss. Hence, he felt that troubles would be detected with resulting benefits to all concerned. To further substantiate his arguments in favor of the system, he listed thirteen results that might be expected from such a plan which he took from an article[1] he had read on incentive wage schemes.

1. The management becomes familiar with details generally overlooked.
2. The viewpoints of both management and shop organization are blended for the common good and better cooperation results.
3. Higher wages are possible.
4. Foremen and superintendents are paid more.
5. The training a checker obtains makes him a good foreman.
6. With set standard more uniform results are obtained.
7. A guide and tool of efficiency becomes the tool of the whole organization.
8. Waste becomes the common foe of all.
9. The true value of time is known.
10. A routine organization becomes a thinking one.
11. New methods are developed.
12. Constant progress towards new methods.
13. Better profits result.

In reply to this, the personnel manager said that, although the immediate results might be somewhat along those lines, in a very short time the system would be simply routine. The control of minutes then would be a great burden because of its high cost and the little added work that the workmen might get out would never compensate for it.

What side of the controversy would you take under the circumstances?

By actually accounting for the minutes spent in this way, could the accountant offer the executives reports that would be worth their cost?

6. Toy and Game Manufacturing Company

RATE SETTING: WHAT FACTORS SHOULD BE CONSIDERED IN SETTING RATES UNDER AN INCENTIVE PLAN OF WAGE PAYMENT?

During the many years that the Toy and Game Manufacturing Company had manufactured wooden toys, puzzles, and a variety of games, their labor force had never been paid other than a day wage. The management, however, felt that with the introduction of many improvements in machinery, it had become possible to place practically the entire plant upon a machine basis. Consequently an investigation was ordered.

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[1] "Effects of Incentive Wage Systems," N. A. C. A. Bulletin, February 1, 1929, p. 707.

The reports rendered showed the management the following facts and proved to their satisfaction that an incentive plan should be introduced. The plant equipment was largely made up of small individually driven and operated units which virtually placed the production of a single machine directly under the control of one person. There were some exceptions to this rule, such as in the rattle-room, where newly cut parts were rattled in large drums to remove the burrs, but most workers could be paid in some manner which would reflect their productive capacity. It was also seen that the production of the individual worker on the same job varied widely.

Of all the incentive schemes of wage payment that were studied, the management chose the Halsey Premium or Gain-Sharing plan because they considered it the most fair and easy to introduce. The day wage under this system was guaranteed to the worker, and the amount of time saved by him relative to a standard set for the task was multiplied by his day rate and divided in some previously agreed upon proportion between him and the company. This plan, as the management saw it, would not only give an incentive to work faster but, if time were saved, the machinery would be used more efficiently while the direct labor cost per piece would be reduced.

The management intended to base the standards for the new system upon past records and, in cases where such records did not exist, to make time studies. Although they felt that the workers in their plant were of a fine type, they suspected that there must have been some soldiering on the job at times in the past, and they knew, too, that when time studies were made, the men were likely to slow up their work somewhat. They also saw the dangers that might arise from incorrect standards, both as to paying unduly high wages and from changing the rates too soon after the introduction of the system. In short, they felt it necessary to anticipate to some degree the results of the incentive wage before setting standards.

The Rate Setting Card (Form 1) was worked out to meet the

RATE-SETTING CARD

Operation Date

Cat. No.

1. Average Full Day's Run D. W.
(Best Full Day's Run D. W.)

2. Plus Factor of Safety of %.

Total Day's Run

3. Plus % As Probable Output on Bonus Basis

4. Hour Rate of Item No. 3 (Quantity of No. 3 Divided by 8.7)

5. Probable Duration of Day's Task (Divide No. 2 by No. 4) Hrs.

6. Summary: Wage Increase %. Cost per 1,000 Net:

Output Increase %

Decrease in Cost %

Toy and Game Mfg. Co.

Form 1.

situation and to show the cost of direct labor per thousand pieces for each operation. Item 1, the average full day's run under day work, was found by taking the arithmetic average for at least 1,500 pieces distributed over a number of workers, past records or time studies being used, as the case demanded. In this way it was hoped that irregularities which might occur because of working conditions or personalities would be avoided. As a check upon this average, the best full day's run under day work was recorded and the variance with the average noted. This variance was used as a basis for adding a certain percentage to the average as a safety measure. The exact percentage varied with each operation, depending upon the decision of the management and was recorded as Item 2. Item 3 was another percentage added by the management and it varied according to the type of operation and the circumstances under which the study of the operation had taken place. This percentage was intended to anticipate the speeding up of the work and added to avoid the dangers mentioned above. Items 4 and 5, respectively, were simply mathematical calculations to find the hour rate and the duration of the task. Item 6 was placed upon the card for the purpose of recording the effectiveness of each change in operation.

Do you consider it proper to allow a certain percentage for safety and another percentage for anticipated results?

What effect might a system of this sort have upon direct labor costs and overhead charges?

7. Mawson Company

LABOR CLASSIFICATION: HOW SHOULD LABOR OF SETTING UP MACHINERY BE CLASSIFIED?

The Mawson Company, located at Detroit, Michigan, operated a woodworking shop, a large part of its business being done for one of the leading automobile corporations of that city. The contract called for prices to be made on a cost plus basis, the cost to include direct material, direct labor, and an additional allowance of 55% of direct labor for overhead.

It had been the practice of the company to include as direct labor the time required to set up the machines when that was done by the operators of the machines. The company considered that any set-up time on the woodworking machinery that had to be set up preliminary to performing a definite piece of work was as much a part of the direct labor as the actual time spent in operating the machine after the job started to run.

The executive in charge of the contract department of the automobile company objected to this method of figuring costs. He maintained that labor required to set up the machines was indirect labor and consequently should have been considered as being allowed for in the fixed percentage for overhead. He stated that in many cases the time required to set up the machines was prolonged by a lack of the proper tools and parts or by a poorly arranged schedule. As these were always the result of inefficient management, he believed that the expense thus entailed should be borne by the woodworking company and not charged to the automobile company.

If you were called upon to arbitrate the dispute, what decision would you render?

C. MANUFACTURING EXPENSE COSTS

1. Santry Mills

DISTRIBUTION OF BURDEN: ON WHAT BASIS SHOULD BURDEN BE DISTRIBUTED IN A TEXTILE MILL?

The treasurer of the Santry Mills received a bulletin from a cotton manufacturers' association describing and recommending a textile cost accounting system. The differences between the method of distributing burden outlined in the bulletin and the method used in the mill brought up the question of whether a change should be made in the latter to conform with the former.

Several representative methods of distributing burden were described in the bulletin as follows:

All Costs Grouped and Charged per Pound of Product

Some mills, at the end of each period, group total net expenditures for cotton used, labor, supplies, salaries, general expenses, and the like, into one grand total. This total is then divided by the pounds of cloth woven (all styles together). This gives them an average cost per pound on all styles. By dividing this by the yards per pound for each style, these mills get what they term the "cost per yard."

That such results are inaccurate becomes evident if one divides the weaving price per cut for each style by the weight of the cut. Most of these mills also pay piece rates on their fly frames, and one can demonstrate again that the cost is not uniform per pound by calculating the cost of piece work per pound of roving.

Overhead Charged Uniformly per Pound of Cloth

Some treasurers contend that it is not necessary to divide the overhead between the weave room and the various yarn departments to get accurate costs by fabrics. They frequently argue that since they sell only cloth, all these charges must be borne by the cloth eventually so that it does not matter how they are distributed so long as the correct total is included. Therefore, after carefully analyzing their labor costs, they revert to the method of averaging the overhead per pound of cloth.

A careful study of the problem, however, shows that it is just as important to correctly distribute the burden as it is to charge each style with its own weaving piece work cost. The overhead charges in a mill using simple looms will have as much bearing upon the cost of the fabrics as the price of weaving. When the mill is equipped with automatic looms, the overhead charges on cloth are often over twice as great as weaving piece work. Any cost system which fails to make each fabric bear its proper share of the overhead is sure to be misleading.

Overhead Charged Uniformly per Spindle

Not a few mills charge all the overhead to the yarn department and assume that it is uniform per spinning spindle, and therefore is greater per pound on fine numbers because of the lower production.

While this method is an improvement over those previously described, it leaves much to be desired, because a careful analysis of the items which make up the overhead shows that between 35 and 50% of them are caused by the mill owning and operating a weaving department, and that they would not obtain in a yarn mill. The results of this method are that the costs of high pick goods and of goods woven on narrow looms are figured too low, and the costs of wider cloth and of low pick goods, such as warp sateens, are figured much too high.

Overhead Charged Uniformly per Loom

Still another method which has a great many advocates charges all the overhead items to the weave room, and assumes that they are uniform per loom regardless of the style of cloth being run. It happens, however, that between 50 and 65% of these charges are due to the yarn departments, and would not obtain if, as in England, the weaving mill should purchase its yarn. That these charges due to the yarn departments are not uniform per loom is quite evident when we consider that it is possible for two looms to use the same counts of warp and filling and yet produce 25 pounds per loom-week on one style and between 50 and 60 pounds per loom-week on another style. In one case it would be necessary to have over twice as much carding and spinning equipment to supply a loom as would be required in the other. Under this method errors of several cents per pound may occur in the relative cost of fabrics.

Assuming the Mill to Be Running One Style

One favorite method of attempting to apportion the fixed charges to the various styles is to assume that they are the same per pound on any style as they would be if the whole mill were put on to that style.

At first thought this may seem like a reasonable assumption, because if any style would throw the mill out of balance and cause idle equipment in certain departments, that style would, by this method of figuring, be penalized with the general expenses chargeable to the idle machinery.

For example, if a mill which is equipped with enough spinning to produce 40 pounds of yarn per loom-week should make filling sateen, which produced 25 pounds per loom-week, this style would be penalized because the looms could not take care of all the yarn and it would be necessary to shut down part of the spinning. On the other hand, if this mill should make a poplin which produces 55 pounds per loom-week, this style also would be penalized because the mill could not produce enough yarn and it would become necessary to shut down looms.

If either of these assumptions should be carried out, the costs estimated by this method would actually obtain, but the fallacy of this system is very evident when we consider that the mill will probably never put all the looms on any one style. It is possible to have the mill perfectly balanced when half of the looms are on each of the above styles, although either of them alone would throw the equipment seriously out of balance.

OVERHEAD AS A PERCENTAGE ON DIRECT LABOR

Another way to distribute overhead is as a percentage of direct labor. This method has quite a few defenders and books have been written in past years advocating it. The method is easy to use, but is inaccurate and misleading for textile mills. A little reflection on the part of any mill man will convince him that there is no uniform relation between the labor cost in each department and the value of the machinery in that department or the power it requires. Both of these items affect that share of overhead which should be charged to a department.

Just how far an average percentage for overhead distribution on the basis of direct labor may depart from the truth may best be shown by the following study based on several mills which have accurate cost records and a proper division of overhead between departments.

By dividing the total overhead by the total direct labor in these mills, we find that the overhead proves to be about 78% of the direct labor. After apportioning the overhead to each department upon an equitable basis, and then dividing each department's share by the direct labor in that department, we have the following results:

Processes through Drawing	Overhead	was	172%	of	Direct	Labor
Roving Frames	"	"	84%	"	"	"
Spinning	"	"	134%	"	"	"
Spooling and Warping	"	"	24%	"	"	"
Dressing	"	"	93%	"	"	"
Weaving	"	"	44%	"	"	"
Cloth Room	"	"	68%	"	"	"

The Santry Mills divided burden into five groups, each of which was distributed quarterly, as shown in Table 1.

TABLE I
DISTRIBUTION OF OVERHEAD—FIRST QUARTER

Department	Group I	Group II	Group III	Group IV	Group V	Total	Mill Labor	Percentage of Department Overhead
Picking and Carding	$ 5,457.48	$18,107.16	$ 8,216.01	$ 4,802.55	$ 1,594.73	$ 38,177.93	(20.62) $ 44,976.20	84.88
Spinning	6,939.63	18,236.31	17,897.79	7,099.49	4,556.79	54,730.01	(26.22) 57,162.35	95.75
Spooling and Warping	1,889.74	2,460.35	617.16	443.38	269.02	5,679.65	(7.14) 15,571.65	36.47
Dressing and Drawing-in	950.16	1,362.56	1,220.00 385.73	801.11	343.67	5,063.23	(3.59) 7,848.15	64.51
Weaving	10,300.94	23,260.32	10,414.67	5,616.56	9,075.73	58,668.22	(38.92) 84,875.45	69.12
Cloth Room	928.99	1,149.45	1,041.47	603.35	194.10	3,917.36	(3.51) 7,656.40	51.16
Total	$26,466.94	$64,576.15	$39,792.83	$19,366.44	$16,034.04	$166,236.40	$218,090.20	76.22
Sizing Material					9,945.53	9,945.53		
Packing Material					2,883.69	2,883.69		
Total					$28,863.26	$179,065.62		
General Expense	$16,966.86							
Administration Expense	9,500.08							
	$26,466.94							
Interest		$14,076.15						
Taxes		20,000.00						
Insurance		5,500.00						
Depreciation		25,000.00						
		$64,576.15						
Power			$39,792.83					
Repairs				$19,366.44				
Supplies					$28,863.26			

Overhead Charges	$ 179,065.62
Mill Labor	218,090.20
Cotton	594,118.06
Selling Expense	26,381.24
	$1,017,655.12

Table 2
Bases of Distribution

Group I	Divided proportionately to Payroll	
II	Divided proportionately to............	Value of space occupied Value of machinery and equipment
III	Divided proportionately to Power used*	
IV	Divided proportionately to............	Space occupied Direct Power (See Power account, Table 5.)
V	Direct	

* Power Charges for the Quarter

Slashers, 13 @ 15 Boiler h.p......................	195	h.p.
Deduct for driving 1% of 7,260....................	73	
	122	h.p.
122 h.p. at $50 per h.p...........................	4) $6,100.00	yearly
	$1,525.00	quarterly
Electric power charges (Power %).................	$26,560.94	
Steam for slashers (Charged direct to Dressing Yarn).	1,525.00	
Balance of charges (Space %).....................	11,706.89	
	$39,792.83	

The following are the percentages that were used in distributing the burden to departments:

Table 3

Department	Payroll	Power	Value of Space and Machinery
Picking and Carding..................	20.62%	23.10%	24.10%
Spinning.............................	26.22	50.10	27.60
Spooling and Warping.................	7.14	1.30	5.30
Dressing and Drawing-in..............	3.59	.80	2.70
Weaving..............................	38.92	24.10	37.20
Cloth Room...........................	3.51	.60	3.10
	100.00%	100.00%	100.00%

The Administration account included expense of maintaining the treasurer's office in Boston, and the administrative salaries of the mill. The other general burden accounts, Power, Repairs, and Supplies, included the subsidiary accounts for one quarter as shown in the following tables:

TABLE 4

GENERAL EXPENSE

(Quarter Ending March 31, 1917)

Subsidiary Account	Payroll	Total All Charges	Group Totals
A. ACCOUNTING			
1. Salaries	$ 2,008.25	$ 2,008.25	
2. Supplies		407.24	
3. Equipment			
4. Telephone, Telegraph, Postage and Express		331.12	
5. Miscellaneous	123.50	188.94	$ 2,935.55
B. TRANSPORTATION			
1. Cotton	2,127.75	2,355.75	
2. Cloth	822.55	1,034.95	
3. Yarn	28.20	28.20	
4. Stores	734.85	815.25	
5. Motor Trucks and Stable		512.44	4,746.59
C. GENERAL MILL			
1. Superintendents	1,900.08	1,900.08	
2. Watchmen	2,394.45	2,394.45	
3. Yard Gang	763.80	779.69	
4. Miscellaneous			
5. Storeroom	310.90	311.27	
6. Waste Handling	185.90	286.83	5,672.32
D. MISCELLANEOUS			
1. Traveling Expenses		227.90	
2. Expenses	26.95	252.44	
3. Donations			
4. Accident Payments		4.00	
5. Securing Help		41.63	
6. Miscellaneous		245.68	
7. Project A	236.20	942.69	1,714.34
	$11,663.38	$15,068.80	$15,068.80
Miscellaneous charges not listed			1,898.06
			$16,966.86

TABLE 5

ACCOUNT NUMBER 8—POWER

(Quarter Ending March 31, 1917)

Subsidiary Account	Payroll	Total All Charges	Group Totals
A. WATER			
1. Labor, Cleaning Racks, Wheels	$ 425.05	$ 425.05	
2. Operating Supplies		74.93	
3. Purchases			$ 499.98
B. ELECTRIC			
1. Supplies (Lamps and Repairs not included)		$ 24.05	
2. Purchases		26,560.94	26,584.99
C. STEAM PLANT			
1. Labor			
(*a*) Boilers and Firemen	770.55	$ 770.55	
(*b*) Coal Handling	573.40	573.40	
(*c*) Ashes	82.60	82.60	
(*d*) Engineer	925.35	925.35	
(*e*) Expert Advice			
(*f*) Compressors, Operation	383.85	383.85	
2. Operating Supplies			
(*a*) Lubricants		5.00	
(*b*) Other Supplies		123.06	
3. Fuel		10,751.54	
		$13,615.35	
Credit Power Company*		1,867.32	11,748.03
D. HEATING			
1. Labor			
(*a*) Number 5 Mill	343.20	$ 343.20	
(*b*) Number 6 Mill			
2. Fuel			
(*a*) Number 5 Mill		266.13	
(*b*) Number 6 Mill		350.50	959.83
	$3,504.00		$39,792.83

* A-1 = $ 398.51
C-1 = 259.20
C-3 = 1,209.61
$1,867.32

TABLE 6

ACCOUNT NUMBER 1—REPAIRS AND MAINTENANCE

(Quarter Ending March 31, 1917.)

Subsidiary Account	Payroll	Stores	Total All Charges	Group Totals
A. BUILDINGS (*Space %*)				
1. Mills	$1,386.45	$ 973.56	$ 2,361.26	
2. Power House	10.45	.75	11.20	
3. Storehouse		69.11	69.83	
4. Miscellaneous	74.55	61.99	136.85	$ 2,579.14
B. MILL MACHINERY (*Direct %*)				
1. Picking	459.30	357.22	816.52	
2. Cards	186.65	191.80	378.45	
3. Roving		237.13	237.13	
4. Spinning	156.25	565.97	722.22	
5. Spoolers	32.45	4.26	36.71	
6. Warpers	7.45	10.81	18.26	
7. Slashers	223.30	272.59	495.89	
8. Drawing-in Machinery		86.20	86.20	
9. Looms	158.05	928.36	1,086.41	
10. Cloth Room	45.05	129.31	174.36	4,052.15
C. MILL EQUIPMENT (*Space %*)				
1. Sprinklers	95.75	30.39	126.14	
2. Fire Protection Appliance	46.75	96.87	144.39	
3. Elevators	43.00	29.24	72.24	
4. Plumbing and Sewerage	176.20	6.78	182.98	
5. Hydrants, etc	243.75	9.08	252.83	
6. Humidifiers	53.90	3.65	57.55	
7. Signal Systems	31.80	8.60	40.40	
8. Shop Machinery	19.85	117.69	138.04	
9. Air Clean System	12.65	177.96	190.61	
10. Motor Trucks, Teams	511.85	*8,040.93	2,560.71	
11. General (undivisible)	177.15	52.68	cr. 3,594.81	
12. Room Equipment	191.70		191.70	362.78
D. TRANSMISSION (*Power %*)				
1. Extraordinary Rep.	422.35	86.45	510.55	
2. Water Wheels, Racks	129.25	cr. 16.74	112.51	
3. Motors	573.25	1,078.45	1,690.51	
4. Generators	48.65	18.61	67.52	
5. Power House Machinery	134.55	1,054.50	1,191.32	
6. Heating System	225.15	121.97	347.27	
7. Lights, Wire, Transmission	131.05	613.62	744.67	
8. Shafting	675.80	5,764.83	6,620.93	
9. Main Belt Drive	93.00	6.23	99.23	
10. Main Rope Drive	52.80	1.66	54.46	11,438.97
E. SUPERVISION (*Space %*)				
1. Draughting	504.40		504.40	
2. Master Mechanic	429.00		429.00	933.40
	$7,763.55	$21,192.51	$19,366.44	$19,366.44

* Inventoried $6,000.

Table 7

Account Number 5, Summarized—Mill Supplies

(Quarter Ending March 31, 1917)

Picking and Carding		
Room Supplies	$ 358.00	
Packing Material	9.62	
Machinery Parts	14.21	
Belting	263.16	
Card Clothing	309.63	
Covering Rolls	215.62	
Skewers	2.48	
Banding	79.44	
Lubricants	261.51	
Miscellaneous	81.06	$ 1,594.73
Spinning		
Room Supplies	$ 288.85	
Broomless Sweepers	950.00	
Filling Boxes	494.24	
Machinery Parts	198.78	
Belting	408.10	
Covering Rolls	1,865.75	
Travelers	111.46	
Lubricants	225.73	
Miscellaneous	13.88	4,556.79
Spooling and Warping		
Room Supplies	$ 155.53	
Belting	48.46	
Bobbins	25.00	
Knotter Parts	24.26	
Lubricants	11.42	
Miscellaneous	4.35	269.02
Dressing and Drawing-in		
Room Supplies	$ 104.92	
Belting	30.58	
Slasher Cloth	141.13	
Sizing Materials	9,945.53	
Lubricants	4.00	
Miscellaneous	63.04	10,289.20
Weaving		
Room Supplies	$ 211.58	
Machinery Parts	3,428.50	
Belting	1,151.31	
Shuttles and Parts	1,085.57	
Reeds	1.85	
Harnesses (Heddles Included)	1,823.90	
Loom Strapping	506.59	
Temple Parts	293.06	
Picker Sticks	58.23	
Pickers	197.25	
Lubricants	273.21	
Miscellaneous	44.68	9,075.73
Cloth Room		
Room Supplies	$ 133.45	
Oil Remover	56.84	
Machinery Supplies	3.81	
Packing Materials	2,883.69	3,077.79
		$28,863.26

The bulletin advocated for gray cloth mills, such as the Santry Mills, a more detailed separation of the constituent parts of burden shown in Table 7.

In the Santry Mills, all insurance charges were grouped and distributed on the basis of value of space occupied by departments. According to the new method Liability and Group Insurance, amounting to about $1,500 per quarter, would be distributed as a percentage of payroll, and Boiler and Fly-Wheel Insurance, amounting to $500 per quarter, would be charged on the basis of power. The mill treasurer, however, believed that this would be complicating the accounting without making an appreciable difference in the cost of the various styles of cloth. Although the distribution of Liability and Group Insurance on the basis of direct labor probably would be more accurate than on the basis of value of space, labor percentages in the various processes differed from the value of space and equipment percentages only slightly, as shown in Table 3. Spinning, for instance, had a value of building and equipment about equal to that of the carding department, and its direct labor was about the same as in the drawing department. On the other hand, charging Boiler and Fly-Wheel Insurance on the basis of value of space would make little difference in the portion borne by these two departments, since the percentages of value of space were approximately equal to the percentages of total power consumed.

If the recommended system were adopted, Office and Executive Salaries would be charged chiefly into Miscellaneous Expense and distributed to the product as a machine charge at the limiting department (usually spinning). In the opinion of the mill treasurer, however, the amount of administration and paper work required at the mill was proportional to the labor costs. Since each department incurred charges for administration, an artificial condition would be created without contributing to correct costs if all these charges were allocated to the spinning department.

In the past the Santry Mills had charged interest only on borrowed money and had distributed it on the basis of the value of buildings, machinery, and equipment. The treasurer, however, was inclined to believe that the product should bear a charge for interest on owned capital as advocated by the recom-

Distribution of Overhead

Typical Items	Basis of Distribution
Property Taxes	Value of Land, Buildings and Machinery
Interest on Plant and Equipment	Value of Land, Buildings and Machinery
Depreciation	Value of Buildings and Machinery
Fire Insurance	Value of Buildings and Machinery
Liability Insurance	Amount of Payroll
Group Insurance	Amount of Payroll
Boiler Insurance	Power Consumption
Fly-Wheel Insurance	Power Consumption
Fuel and Purchased Power	Power Consumption
General Supplies	Records of Supply Consumption*
Repairs	Records of Repair Work Done*
Office and Executive Salaries	May be subdivided between material expense, selling expense, and miscellaneous expense
Capital Stock Tax	Value of Land, Buildings, and Machinery
Interest on Cotton	Material Expense
Interest on Cloth	Selling Expense
Interest on Supplies	Records of Supply Consumption*
Interest on Stock in Process	Value of Stock in Process
Interest on Cash	Miscellaneous Expense
Licenses, Donations, etc.	Miscellaneous Expense
Legal Expenses	Miscellaneous Expense
Use and Occupancy Insurance	Miscellaneous Expense
Office Expenses	May be subdivided between material expense, selling expense, and miscellaneous expense
Power Charges	Redistributed on Power Consumption Basis
Repair Shop Charges	Records of Repair Work Done*
Material Expense	Applied directly to raw material cost
Miscellaneous Expense	Applied as a machine charge at the limiting dept. (usually spinning)
Brokerage and Commission	Deducted from selling price
Other Selling Expense	Applied directly to the product

* Where records are not available, recourse must be had to local knowledge of conditions and experience in the treatment of this feature in other similar plants.

mended system, since, unless this was done, interest charges incurred in each quarter might vary to such an extent that costs would not be comparable. Money invested in the business furthermore should yield an income equal to what it would yield outside the business.

Material Expense, which was charged into General Overhead, would be applied directly to Materials Handled under the proposed system. Although this would reflect conditions more accurately than according to payroll, the treasurer asserted that, since these charges, which amounted to about $1,000 a quarter, were incurred in all departments in about the same proportion as under the payroll division in use, nothing would be gained by making the change.

The same was true of Miscellaneous Charges as of Office and Executive Salaries; the application to any particular department could not be as equitable, according to the treasurer, as a method which distributed them over all.

Should the Santry Mills have adopted the suggested method of distributing burden?

If not, what changes should have been made in the method used by the Santry Mills?

2. Schaffer Machine Works

MACHINE HOUR COSTS: WHAT CONDITIONS MAY MAKE IT DESIRABLE TO REVISE THE METHOD OF DISTRIBUTING BURDEN?

The Schaffer Machine Works engaged the accounting firm of Anderson and Porter to make a study of its cost accounting system and to report whether the method of distributing overhead then being used should be retained or whether a complete revision should be made.

The costing system that had been used by the company was based upon standard machine-hour rates, which were based upon previous experience of costs and normal running hours; burden was applied currently to jobs by means of these machine rates. The usual accumulation methods showed how much burden had been thus absorbed, or charged to jobs, in each department. At the end of the period the actual expenses were assembled on a sheet as given herewith (Form 1), distributed to departments on the basis shown, and the totals so arrived at compared with the total amounts of burden which had been charged to jobs at the standard rates. This form, therefore, served two purposes: it showed a distribution of the actual burden; and, also, by comparing the actual expense with the standard expense allocated, it proved the correcting factor to be applied to current machine rates to make them satisfactory for the coming period.

EXPENSE DISTRIBUTION SHEET

				Shop Expense					Construction, Product, and Stores Sold					
		Column Symbol	B	A	T	M	D	L	X	Y	W	G	S	
		Expense Rates	Operating Expense	Auxiliary Shop Expense	Tool and Pattern Department	Manufacturing Department	Drawing Room	Total Shop Expense	Part Construction	Construction Except Drawings	Worked Materials	Drawings	Stores Sold	Total
		Account Symbol	B	A	DT	DM	DD	A+T+M+D	X	Y	W	G	S	
Wages	1													
Stores	2													
Miscellaneous From Journal	3													
Prorated accounts	4													
Enter 5% for expense for stores sold at 5S also enter same amount in red ink at 5A as credit to auxiliary shop expense.	5			5% Enter in red of 2S −				Totals of shop expense entries					5% of 2S +	
Miscellaneous from record a/c payable.	6													
Total all columns	7		B											
Apportion operating expense to (Part-construction, construction, worked materials	9		Total operating expense						B	B	B			
Total part construction	10								X	50%				
Apportion part construction to (Construction and auxiliary shop expense	11		Apportion to 9X-9Y-9W	50% of 10x					Total part construction					
Total auxiliary shop expense	12			A					Apportion to 11A-11Y					
Apportion auxiliary shop expense to (Tool department, manufacturing department, and drawing room	14			Total auxiliary shop expense	A									
Total tool department shop expense	15				DT									
Apportion tool department shop expense to (Manufacturing department, construction and worked materials	17			Apportion to 14T-14M-14D	Total tool department shop expense	DT	DD			DT	DT			
Total manufacturing department—and drawing room—shop expense	18				Apportion to 17M-17Y-17W	DM				DD		DD		
Apportion manufacturing department shop expense to (Worked materials	21					Total manufacturing department shop expense	Total drawing room expense	Total shop expense		DM	DM			
Total manufacturing cost of (Construction, worked materials, drawings and stores sold	22					Transfer to 21-W	Apportion to 18Y-18G	18L = 7L + 11L = 15T + 18M + 18D						
										Total manufacturing cost of Construction	Worked materials	Drawings and estimates	Total selling cost of stores sold	
Enter sum of wages for part construction, construction, worked materials, at 8L: and then determine **Operating expense rate**	8	B Rate $\frac{7B}{8L}$						8L 1X + 1Y + 1W						
Enter hours x cost numbers in each department at 13T, 13M, and 13D respectively and total same at 13L: and then determine **Auxiliary shop expense rate**	13	A Rate $\frac{12A}{13L}$			DT	DM	DD							
Enter hours x cost numbers in tool department for manufacturing department construction, and worked materials at 16M, 16Y, and 16W, respectively and then determine **Tool department shop expense rate**	16	DT Rate $\frac{15T}{13T}$			Hours x cost numbers in tool department 13T = 16M + 16Y + 16W	DT	Hours x cost numbers in drawing room	Grand total of hours x cost numbers 13L = 13T + 13M + 13D		DT	DT			
Enter hours x cost numbers in manufacturing department for construction and worked materials at 19Y and 19W respectively: and then determine **Manufacturing department shop expense rate**	19	DM Rate $\frac{18M}{13M}$				Hours x cost numbers in manufacturing department				DM	DM			
Determine **Drawing expense rate**	20	DD Rate $\frac{18D}{13D}$								DD		DD		

Form I.

Schaffer Machine Works. To face page 184

ACCUMULATION OF SHOP EXPENSES

All the actual expenses other than direct material and labor were gathered at the end of the month under five heads as follows:

1. Operating Expense.
2. Auxiliary Shop Expense.
3. Tool and Pattern Department Indirect Expenses.
4. Manufacturing Department Indirect Expenses.
5. Drawing Room Indirect Expenses.

The Operating Expense included such general expenses of the factory as the wages, supplies, and other expenses of each of the following: general office, order clerk, purchasing and shipping departments, watchmen, restaurant, factory magazine, and other welfare work.

The Auxiliary Shop Expense, that is, the auxiliary expense of supervising and facilitating shop work, contained the general costs of directing the operations of the manufacturing departments. It included the power, heat and light, boxing expense, the wages of storekeepers and balance clerks, the expenses of the cost, planning, and routing departments, losses from spoiled material, and the expense of conducting manufacturing experiments.

The last three headings between them contained all the other indirect departmental expenses, such as indirect material and labor, departmental repairs, upkeep of buildings and equipment, and the fixed charges.

DISTRIBUTION TO PRODUCING DEPARTMENTS

The foregoing represented the first general assembling of burden expenses. The next main step was the redistribution of these five classes of expense to accounts representing the direct producing departments. These were as follows:

1. Part Construction, or construction of new equipment about which there was a dispute as to whether the expenditure should be capitalized or charged to expense.
2. Construction, or the work done in making additions to plant and equipment.
3. Worked Materials, or the account for work in process.

4. Drawings, which was treated as a separate producing department.
5. Stores Sold, or the expense of handling materials sold from stores, without manufacturing work having been done on them.

The work of distributing the shop expenses to these five production accounts proceeded as follows:

1. Operating Expense was distributed to Part Construction, Construction, and Worked Materials on the basis of the direct wages paid in those departments.
2. At this point the Part Construction total was divided equally between Auxiliary Shop Expense and Construction.
3. In Stores Sold column, 5% of the quantity of stores shown as having been sold was charged as handling expense; the same amount was credited in the "Auxiliary Shop Expense" column.
4. The Auxiliary Shop Expense was then distributed to Tool and Pattern Department, Manufacturing Department, and Drawing Room. This distribution was made on the basis of the machine costs which had been charged to production, within each of the departments named, at the standard machine-hour rates.
5. Tool and Pattern Department Total Expense was then allocated to Manufacturing Department, Construction, and Worked Materials, also on a basis of standard machine costs actually charged to production in these three departments.
6. The Manufacturing Department Expense then accumulated was overhead on work in process, and was accordingly transferred to Worked Materials. If Worked Materials was subdivided into different kinds of product, the total was apportioned among them in proportion to the machine burden which had been attached to each.
7. Drawing Room Expense was divided between Construction and Drawing on the basis of burden for each of these departments already applied to product at the standard rates.

This completed the shop expense distribution; all burden was by then allocated to the producing departments.

MACHINE-RATE COMPUTATION

The machine rates above referred to were found by allocating all the expense of the department in question to the several machines within it, on a suitable basis somewhat as follows:

1. Building charge (based on a share of the total cost of maintaining the buildings proportionate to the square feet of floor space occupied by the machine).
2. Depreciation (from 5 to 10% of original cost of machine).

3. Taxes (prorated on depreciated value of machines at the first of the year).
4. Insurance (prorated on depreciated value of machines at first of the year).
5. Stores and Supplies (actually used during the past year prorated to machines).
6. Repairs (actually made during the past year on the machines in question).
7. Tools and jigs (used during the year on that particular machine).
8. Planning expenses (prorated).
9. Functional foremen (prorated).
10. Miscellaneous labor actually charged to that machine during the year.

The total horse-power-hours for the factory (obtained by multiplying the hours run by each machine by its rated horse-power consumption, and adding them to get the total for all machines) was divided into the total cost of power for that year to determine the cost per horse-power-hour. From this the cost of power for each machine for any month during the year following was determined by multiplying this cost per horse-power-hour (obtained from the previous year's actual figures) by the normal hours that the machine was to be run during the month in question. This was added as an eleventh item to the items listed above as "Machine Expense." The final total was divided by the normal number of hours run by the machine to get the computed rate of machine-hour cost for each machine. For ease in calculating, the figure taken was the nearest whole number of cents.

At the end of a year, the actual number of hours run by each machine was expressed as a percentage of the total possible running hours, as an index of the efficiency with which the company used these machines.

The distribution of indirect expense to jobs was then made by taking the hours run on each job, and multiplying them by the machine rate in question. If all expenses had been as much as anticipated, and if machines all ran the normal number of hours, the total burden charged to production in these machine rates would be equal to the total amount of burden expenses actually incurred.

Should this method of distributing overhead be continued?

MACHINE-HOUR COST

What would be the machine-hour cost of the Perkins Engine Lathe No. 14 at the Shaffer Machine Works to be used in figuring the monthly overhead distributions, when the previous year's figures on which it was based were as follows:

Cost of Maintaining the Buildings

Depreciation	$ 8,973.84
Care of grounds	694.70
Repairs and upkeep	6,862.12
General factory lighting	235.27
Cleaning	184.12
Heating	727.91
Insurance on buildings	5,376.51
Taxes	6,720.28
	$29,774.75

Area available for manufacturing—67,196 square feet.

Area required by Engine Lathe No. 14, including share of aisle space—60 square feet.

Original cost (the machine now being one year old) of Engine Lathe No. 14, $408.66.

Depreciation, $7\frac{1}{2}$%.

During 1920 there were 2,600 working hours at the Shaffer Machine Works. Work reported on Engine Lathe No. 14 totaled 2,080 hours. The normal running hours for this lathe were computed at 2,400 per year. The cost of power for the factory was $0.013 per horse-power-hour. The horse-power required to operate Engine Lathe No. 14 was .75.

Other charges against the Perkins Engine Lathe No. 14 were as follows:

Proportion of taxes	$ 5.26
Proportion of insurance	6.30
Proportion of stores and supplies	19.15
Repairs	17.64
Tools and jigs used	84.37
Proportion of planning expense	34.79
Proportion of functional foremen	65.31
Miscellaneous labor used in maintaining it	35.19
	$268.01

DISTRIBUTION OF BURDEN

The actual expenses for April were collected together for checking up with the amounts charged to product at the standard rates, and showed the figures given in the following table (Table 1):

TABLE 1

APRIL, 1923, TOTALS

Item	Wages	Stores	Miscellaneous Journal Entries	Prorated General Accounts (Supplied from the Treasurer's Office)	Accounts Payable
Operating Expense....	$2,962.60	$ 76.58	$ 96.98		$ 508.90
Auxiliary Shop Expense	3,545.01	2,136.74	343.95	$282.32	3,798.45
Tool and Pattern Department..........	645.55	76.41	3.49		42.00
Manufacturing Department...............	4,553.39	1,445.58	68.82		36.08
Drawing Room........	476.01	56.57			4.12
(Totals).............					
Part Construction.....	$ 6.79	$ 242.55			$176.67
Construction of Machines..............	1,303.27	95.04	$ 21.74		240.00
Worked Materials.....	9,607.54	14,274.47	1,770.36		1,024.93
Drawings.............	201.02				
Stores Sold..........		922.96			
(Grand Totals)........					

The amounts which were charged to production for burden, at the standard machine rates, had during April amounted to the following sums in the departments shown:

For the Tool Room

$1,184.49	In the manufacturing department
913.77	Construction
526.93	Worked materials
$2,625.19	Total tool room machine-hour cost

For the Manufacturing Department

$9,080.61 Worked materials (line No. 13—Form 1)

For the Drawing Room

$389.50	Construction (line No. 20—Form 1)
201.02	Drawings
$590.52	Total for drawing room (line No. 13—Form 1)

In distributing the Auxiliary Shop Expense, Account A, the machine-hour cost was "weighted" by taking (for this calculation only):

One-half the total tool room machine-hour cost for DT..........	$ 1,312.60
All of the manufacturing department machine-hour cost for DM ..	9,080.61
One-tenth of the drawing room machine-hour cost for DD	59.05
	$10,452.26

(This total is used in calculation No. 13 in column L—Form 1.)

What are the total charges to Construction, Worked Materials, Drawings, and Stores Sold after the overhead has been applied?

3. Red Metal Manufacturing Company

FURNACE-HOUR RATE: WHEN IS A FURNACE-HOUR RATE MORE SUITABLE AS A BASIS FOR DISTRIBUTING BURDEN TO PRODUCTS THAN A PERCENTAGE OF LABOR?

The works cost accounting department of the Red Metal Manufacturing Company presented to the controller a set of furnace-hour rates to be used, in place of the then current methods, in charging operating costs of the casting division to the product.

The system in force at the time, 1922, was as follows: Each master caster operated under normal conditions five or six furnaces at a time; he was paid on a piece work basis, the rate being expressed as so much per hundred pounds of good metal produced; his helpers were paid so much a round, or charge. A charge was the term used to describe one furnace cycle, which consisted of placing the raw material (copper and zinc) in the furnace, heating it to the proper temperature, stirring it, and pouring it into molds. The average cycle was of one and one-half to two hours' duration; the higher the zinc content, the shorter the time required. Heating was continuous throughout the cycle; the raw material was put into the furnace a little at a time, and each addition of material was allowed to melt before more was added. Pouring was commenced about a half-hour after the last addition.

The sum of the compensation paid to casters and to helpers constituted the direct labor cost involved. All other costs, including payment of foremen, core-making, fuel, maintenance, depreciation, and rent, were grouped into one sum. The caster's piece rate tickets indicated the shapes upon which he had worked and the amount of time consumed. The helpers' wages were allocated to the product in the same proportion as the caster's.

Overhead formerly had been loaded as an arbitrary percentage of the direct labor based upon past experience. Some refinements of cost method recently had been introduced, however, whereby overhead was added as a varying percentage of direct labor, differing according to the kind of mixture in question, since bronze, for example, took roughly, twice as long to melt as brass, while copper required one and one-half times as long as brass. But for some time it had been apparent that in order to meet competitive conditions, a still more detailed and exact method of cost accounting for the casting shop work was necessary.

The furnace-hour rates presented by the cost accounting department were based on the following procedure.

Basis of Normal Production. A test period of three months was decided upon. The potential theoretical production of the plant for a three months' period was computed by the engineers as 6,000,000 pounds. Allowing for repairs and idleness of equipment for all reasons, the engineers established a normal volume of production of 4,000,000 pounds. On this production all estimates were based in order to give complete absorption of overhead under normal conditions. Actual performance for the three months was recorded and adjusted in each case to the normal production, which was assumed to be 4,000,000 pounds.

Rent. The engineers, taking into consideration the type of building (Class A, B, or C construction) and the utility of the space for the purpose for which it was used, evaluated all space in the various buildings. If a department was in an inferior location, it received the benefit of the cheaper rent, but if it was in a better room than necessary, it was not penalized by a higher rent. All floor space was given a weight, based upon a system of rating in which a first floor in a Class A building was rated as 100%. A square-foot rate, used to apply rent to departments, was obtained by dividing the total rent of all buildings by the total weighted area. The casting department accordingly was responsible for the weighted area of its floor space times this unit rate. Although in this space there were 33 furnaces of 3 types which varied slightly in size, the variation was considered small enough to be ignored. Since it was estimated that 30,000 furnace-hours would be required to produce the established normal production of 4,000,000 pounds, an hourly charge for rent was obtained by dividing the total rent cost by 30,000.[1]

Fuel. The actual coal consumption of the three types of furnaces was recorded during the test period. Since the production of this period was below normal, the fuel consumption was increased to represent the assumed normal production. The relative operating time of the three types of furnaces was established by a study of past records. It was found that Type C operated only about 2,500 hours to produce the normal production as against 27,500 hours for Types A and B. By dividing the total cost of fuel consumed by each type of furnace by the number of hours it must operate to produce the normal production, a fuel-hour rate for each type was obtained which was added to the first element of rent.[2]

Relining and Repairs. Actual repairs for each type of furnace were analyzed over a period of six months, including the three months' test period. This figure, which was corrected to allow for normal production, was divided by the total number of hours necessary for each type of furnace, in order to secure an hourly charge to be added to the elements already determined. It was

EXHIBIT 1

TEST PERIOD ANALYSIS OF DIRECT-LABOR HOURS WORKED, BY FURNACES AND SHAPES, IN RED METAL MANUFACTURING COMPANY

*I	Flats and small billets—Type A furnace	11,800 hours
II	Flats and small billets—Type B furnace	400
III	Extrusion—Large Type A furnace	1,800
IV	Extrusion—Large Type B furnace	3,500
V	Shells, Type A	2,000
VI	Rods, Type C	2,500
	Total	22,000 hours

* The six furnace-hour rates will be referred to hereafter by these numerals.

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[1] See Exhibit 6, p. 197.

[2] Six different furnace-hour rates were eventually found to be necessary to cover the three types of furnaces and various shapes of rods and bars which required different equipment and different amounts of labor in connection with the pouring. In case electric furnaces were employed, records would be kept of kilowatt-hour consumption per furnace instead of fuel consumption.

found that Type B furnace required 40% more maintenance than Type A, while Type C required 20% less than Type A. The total relining and repair charges were apportioned accordingly.[1]

Direct Labor. Two factors entered into determination of direct labor: the average number of furnaces used during the period, and the average number of men per furnace, per shape poured. Actual analysis of the work produced during the three months' period appears in Exhibit 1.

This total of 22,000 hours was corrected to 30,000 hours to obtain the normal production, in order that the relationship between the various shapes, as indicated by the hours during which they occupied the furnaces during the test period, might be maintained. By dividing the total hours of each shape, corrected to the 30,000 hours' total, by the possible operating hours for one

EXHIBIT 2*

COMPUTATION OF LABOR FACTORS FOR DIFFERENT FURNACE-HOUR RATES IN RED METAL MANUFACTURING COMPANY

	(*a*)	(*b*)	(*c*)	(*d*)	(*e*)	(*f*)	(*g*)
Rate	Average Number of Casters per Furnace	Average Number of Moldmen per Furnace	(*a*) + (*b*)	Relative Number of Men per Furnace	Average Number of Furnaces Used at One Time	(*d*) × (*e*) Labor Factor	(*f*) Expressed as Percentages
I	1	$1\frac{1}{3}$	14/6	14	7	98	36.76%
II	2	2	24/6	24	1	24	9.00
III	1	$\frac{2}{3}$	10/6	10	$2\frac{1}{2}$	25	9.36
IV	2	1	18/6	18	3	54	20.18
V	1	$1\frac{1}{2}$	15/6	15	2	30	11.20
VI	2	2	24/6	24	$1\frac{1}{2}$	36	13.50
						267	100.00%

* See also Exhibit 6, page 197.

NOTE: To get direct-labor hourly rate for No. I:

Labor factor (I), times total payroll for test period equals amount to be absorbed by (I); this amount, divided by number of hours actually operated on (1), gives hourly rate. Thus:

$$\frac{36.76\% \times \$19{,}300}{11{,}800} = \$0.60$$

Indirect labor for (I) obtained in similar fashion: $\frac{36.76\% \times \$8{,}300}{11{,}800} = \$0.26.$

[1] See Exhibit 6, p. 197.

furnace, the average number of furnaces used per shape during the test period was obtained. This figure was the first factor required in determining direct labor.

The number of casters and moldmen required to pour each shape was definitely known, and was expressed as a relative. By multiplying the average number of furnaces poured during the period by the labor factor per furnace, a direct-labor factor per furnace per shape was obtained. This new factor, although called the direct-labor factor, actually took into account the type of furnace, the shape, and the labor. Six of these factors were determined; they were to be known thereafter as direct-labor factors. The direct-labor payroll for the test period was apportioned to the six furnace-hour rates according to the direct-labor factor. The indirect-labor payroll was handled in the same manner.

Supplies. Oil used in the molds, which was the only large item, was apportioned separately. Records were kept for the three months' period showing the number of gallons used for the different kinds of molds. The total expenditure for oil was increased to cover normal production, and was apportioned among the six rates on a basis of the results of the actual observations for the three months' period. All other supplies were grouped and apportioned to the various rates on a basis of the direct-labor factor.[1]

EXHIBIT 3

OIL DISTRIBUTION FOR COMPUTATION OF FURNACE-HOUR RATES IN RED METAL MANUFACTURING COMPANY

I and II	Flats and small billets	77%
III and IV	Extrusion	7
V	Shells	10
VI	Rods	6

General Mill Expense. This item, which included such accounts as works accounting, engineering, manager's office, employment, supplies, stores, and yard service, was distributed on the basis of the direct-labor factor after being increased to nor-

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[1] See Exhibit 6, p. 197.

EXHIBIT 4

COMPUTATION OF FURNACE FACTORS TO DISTRIBUTE DEPRECIATION IN RED METAL MANUFACTURING COMPANY

	(a)	(b)	(c)	(d)	(e)	(f)
Type	Average Number of Furnaces in Use at a Time	Relative Original Value	Furnace Factor (a)×(b)	(c) on Percentage Basis	Total Hours Operated by Type	Hourly Depreciation Charge $(d)\times\frac{\$1,500}{(e)}$
	(from Exhibit 2)				(from Exhibit 1)	
A	7+2.5+2=11.5	1	11.5	40.6%	15,600	$0.039
B	1+3 = 4	2	8.0	27.7	3,900	0.108
C	1.5	6	9.0	31.7	2,500	0.190
			28.5	100.0%		

mal according to the judgment of the men in charge of the departments incurring the expense.[1]

Maintenance and Repairs. Analysis of past records showed the Type C furnace to be directly responsible for 40% of the cost of maintenance and repairs, because this type was operated at a higher temperature than Types A or B. These costs were increased to provide for normal production and applied to the rate for Type C furnaces. The balance of the maintenance and repairs costs was spread over the rates, including the Type C rates, on the basis of the direct-labor factor.

Machine Depreciation. The ratio of original cost of Types A, B, and C furnaces was one to two to six. The factor representing the relative number of hours each type of furnace would operate to produce normal production was multiplied by this factor of original value, in order to obtain a new factor on the basis of which the total amount of depreciation determined by the directors was apportioned to the various furnace-hour rates. This new addition to the rate took into consideration three elements: number of furnaces in use at a time; the original value; and total hours operated during the test period. The suggested practice was to compute depreciation on each individual machine as a definite element of cost, but to pool the charges as built up for individual furnaces, and then distribute the total by means of furnace factors, as computed in Exhibit 4.

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[1] Computed exactly as direct and indirect labor.

Metal Stores. The metal stores department received both old scrap and virgin metal, which it weighed into boxes or batches of the desired quantity. The output of the metal stores department was therefore measured by boxes. Since a mixture containing more ingredients required more labor in weighing out the batches, the relation between the scale-man-hours and the furnace-hours for the different shapes was established during the test period by time studies. Inasmuch as the same shapes generally took the same mixtures, the number of scale-man-hours per shape for normal production was established. The total cost of metal stores was therefore distributed to shapes on that basis, divided by the normal furnace-hours per shape to give an hourly rate.

Cores—for shell casting only. Raw materials for cores were figured at standard rates. The total direct labor for the test period divided by the core production, minus a 5% allowance for breakage, gave the direct-labor cost per core. Six thousand cores was assumed to be a normal production for three months. The total core-room rent was divided by this figure, in order to secure a per core charge, which was added to the labor cost per core. Depreciation, power, light, heat, and other overhead charges in the core-room were reduced to a per core basis. The total per core cost was then transformed into an hourly charge by multiplying by the normal number of cores used per hour. This hourly charge was added to the furnace-hour rate for Type

EXHIBIT 5*

HOURLY RATES COMPUTED FOR DISTRIBUTION OF METAL STORES CHARGES IN RED METAL MANUFACTURING COMPANY

	(*a*)	(*b*)	(*c*)	(*d*)	(*e*)	(*f*)
Rate	Scale-Man-Hours per Furnace-Hour	Furnace-Hours	(*a*)×(*b*)	(*c*) on Percentage Basis	Share of Metal Stores Cost (*d*)×$19,000	Per Hour Charge (*e*)÷(*b*)
I and II	0.3	11,800+400	3,660	38.0%	$7,220	$0.59
III and IV	0.4	1,800+3,500	2,120	22.0	4,180	0.79
V	0.3	2,000	600	6.2	1,180	0.59
VI	1.3	2,500 (3,900)	3,250	33.8	6,420	2.56
		22,000	9,630	100.0%		

* See also Exhibit 6, p. 197.

A furnace when casting shells. This was the only rate affected by core charges.

EXHIBIT 6

AMOUNTS BY ITEMS, AND IN TOTAL, IN SIX FURNACE-HOUR RATES OF RED METAL MANUFACTURING COMPANY

Item	I	II	III	IV	V	VI
Rent	$0.112	$0.112	$0.112	$0.112	$0.112	$0.112
Fuel	0.610	0.910	0.610	0.910	0.610	1.350
Relining and Repairing	0.125	0.175	0.125	0.175	0.125	1.100
Direct Labor	0.600	4.350	1.000	1.110	1.080	1.040
Indirect Labor	0.260	1.870	0.431	0.478	0.465	0.450
Supplies, Oil	0.126	0.126	0.026	0.026	0.100	0.048
Other	0.218	1.940	0.364	0.405	0.392	0.378
General Mill Expense	0.450	3.260	0.755	0.835	0.812	0.430
Maintenance and Repairs	0.265	1.910	0.442	0.490	0.475	0.468
Extra Repairs	......	......	......	......	......	1.200
Depreciation	0.039	0.108	0.039	0.108	0.039	0.190
Metal Stores	0.590	0.590	0.790	0.790	0.590	2.560
Cores	......	......	......	......	0.185	......
Total	$3.395	$15.351	$4.694	$5.439	$4.985	$9.326

Recapitulation. The 6 final furnace-hour rates thus contained 11 parts, except Numbers V and VI, each of which contained 12. The general method of determining the rates was to assume an arbitrary figure of normal production, and to determine charges on that basis. One advantage claimed for this method was that any change in an individual element, such as labor, or rent, could be readily incorporated into the rate without affecting other elements.

EXHIBIT 7

TOTAL COST FOR TEST PERIOD OF VARIOUS FACTORS, AND BASIS OF DISTRIBUTION IN RED METAL MANUFACTURING COMPANY

Item	Amount	Basis of Distribution
Direct Labor	$19,300	Labor factor
Indirect Labor	8,300	Labor factor
Supplies, Oil	2,000	(See Exhibit 3)
Supplies, Other	7,000	Labor factor
General Mill Expense	14,000	Labor factor
Maintenance and Repairs	8,500	Labor factor
Depreciation	1,500	Furnace factor
Metal Stores	19,000	(See Exhibit 5)

The company decided to adopt the accountants' plan. During several years of use, it was found to give complete satisfaction, and no important changes of method were made.

Should the proposed furnace-hour rates have been adopted? If so, what modifications should have been made, if any, in their computation?

4. FAIRFAX WIRE COMPANY

DISTRIBUTION OF FACTORY BURDEN: WHAT FACTORS SHOULD DETERMINE THE METHOD OF BURDEN DISTRIBUTION?

The Fairfax Wire Company manufactured a great variety of twisted wires and cables, and also a number of electrical specialties. It did no wire-drawing in its own plant, but purchased wire which it afterwards twisted, braided, and insulated in many forms for different purposes.

For operating and for accounting purposes the plant was divided into approximately 60 centers. A center was a section of a main department or building, in which a specific operation or group of operations was performed, sometimes by a number of similar machines, and sometimes by one or two principal machines, with other different machines performing operations supplementary to those of the principal machines. Even where all the machines were similar, they might be of different sizes and so require subdivision for cost accounting purposes.

Production was divided about equally among three general types of goods. The first type included all standard wires produced for stock, which were those called for by consumers for general use. The second type consisted of wires being produced over a period of time to fill large orders for which formal contracts had been made with the buyers. The third general type included all kinds of special order work where specifications other than the stock standards were required by the buyer.

When an inquiry was received at the sales office, a quotation was immediately supplied to the customer by the estimating department. If the quotation was accepted, an order was given to the factory to deliver or manufacture the goods called for, and no further provision was made at any point to check the costs of that particular order. The quotation was built up from cost sheets supplied to the estimating department by the factory superintendent.

No costs of separate jobs were kept. For every type of wire manufactured by the company a separate Cost Sheet was submitted to the estimating department. These sheets, which were compiled by cost clerks, showed for each type of wire the cost, per 1,000 feet, of raw material, of partly manufactured material, and of direct labor. The Cost Sheets were rechecked regularly to insure their accuracy; they were altered at once to reflect changes in the direct labor costs; and the purchasing department furnished the estimating department weekly with a sheet indicating the price at which each kind of raw material was to be charged during the following week.

Practically all the manufacturing processes in the production of insulated wire were carried on by machines, which varied in size from large types costing thousands of dollars each to small braiding and twisting machines. Some departments had only two or three large machines, whereas others had as many as 2,000 small machines. On a few of the large machines a machine rate was used to distribute burden. This rate applied to running time, since idle time and setting-up time were included in the overhead charges. In general, however, the burden was distributed as a percentage of direct-labor costs.

In the summer of 1923 the Fairfax Wire Company changed its method of distributing factory burden from a direct-labor-cost basis to a machine-hour basis.

The first reason given by the factory manager for the change was that the labor-cost basis was believed to be inaccurate; the labor cost bore no relation to the cost of a machine, the floor space it required, or the power it used, which were the principal manufacturing costs. On most products, the cost of direct-labor was no more than 15% or 25% of the total manufacturing cost.

In the second place, the company realized that it was not making a fair profit on some lines. The labor-cost basis resulted in an overcharge for burden costs on some lines and in an insufficient charge on others. Under keenly competitive conditions, "business follows estimates"; in the case of the Fairfax Wire Company, these estimates were too low because of inadequate knowledge of the real costs. Not only for purposes of control, therefore, did the Fairfax Wire Company want to know the cost of each line as closely as possible, but also because it wanted to secure a fair profit on every product. The company looked with disfavor upon the policy of establishing "line leaders" to be sold at a loss in order to attract additional orders which, it was hoped, would be profitable.

In the third place, the manager decided that the direct-labor-cost method was not adapted to the bonus system of wage payment which the company desired to use. The bonus was computed from the combined efficiency of the machine and operator for a full week, based both on production and on hours operated. The labor-cost method of distributing burden did not sufficiently distinguish between savings effected through increased labor efficiency and those resulting from improved machine methods. The manager explained that many economies were attributable to better machinery. As an example of how improved mechanical devices affected production, he stated that during one fiscal period the company had increased production about 20%, but that during the same period the number of employees had decreased about 2%.

As a result of the adoption of a machine-hour rate by the Fairfax Wire Company, many lines of product received burden charges substantially different from those computed under the previous rates, and the company's price policies were materially affected.

METHOD OF FIGURING MACHINE-HOUR RATE

The first step in finding the rate for each machine was to assemble all factory charges, not including general administrative or selling expenses, into 12 classes, divided into 2 main groups. The first group included fixed burden charges and the second included operating burden, as follows:

FIXED BURDEN

Fixed Employees
Foremen
Rent
Machinery Depreciation

OPERATING BURDEN

Operating Employees
Indirect Labor
Indirect Materials
Steam
Water
Gas
Fuel Oil
Power

A consolidation of items occurred when the division into 12 classes was made; among the classes of fixed burden a fifth group, Machine Shop General, formerly had been used. Upon investigation it had been observed that this class of expense was small, compared with other groups, and, what was more important, that these expenses were mostly related to space occupied and could, therefore, be distributed to burden centers on a square-foot basis. This category was accordingly abandoned as a separate group and was consolidated with Rent. In the operating burden group a reverse process occurred; the two classes designated Indirect Labor and Indirect Materials formerly had been consolidated as Repairs and Supplies. It was, however, considered desirable to observe separately the labor and materials used for this purpose and the two were accordingly set up as separate classes.

The actual work of computing machine-hour rates was performed on a series of cards, here designated as Forms 1, 2, 3, and 4. These cards were not used merely to compute the burden rate; they also served as detailed records of the items entering into any of the 12 major classes of expense items or making up any one center or group of machines. In this respect they tied in with the more summarized figures given in the accounts of the Factory Ledger. They were, moreover, kept as a continuous record, and from them new actual burden rates were computed quarterly; a comparison thus was afforded with the standard burden rate previously computed for use in charging burden to the finished product.

A card like Form 1, front and back, was used to assemble each of the 12 major expense classes listed above.

Each of these cards usually contained a variety of charges, and the different kinds of items constituting the major class were subdivided by being listed in the columns headed A, B, C, and so on. The column at the right, headed "Key," was filled in with the names of the items represented by these letters. Thus on the card for Fixed Employees the following items were found:

A. Factory Office Payroll
B. Chemical Laboratory
C. Factory Office Supplies
D. Superintendents' Payroll
E. Fire Insurance (a fraction)
F. Taxes (a fraction)
G. The House Journal Expense
H. Foremen's Dinner
I. Hospital

The card for Operating Employees, on the other hand, contained a variety of shop expenses more or less connected with

MONTH	A	B	C	D	E	F	G	H	I	J	K	TOTAL	KEY
JAN.													A
FEB.													B
MAR.													C
APR.													D
MAY													E
JUNE													F
JULY													G
AUG													H
SEPT													I
OCT													J
NOV.													K
DEC.													
TOTAL													
EST. MONTHLY													

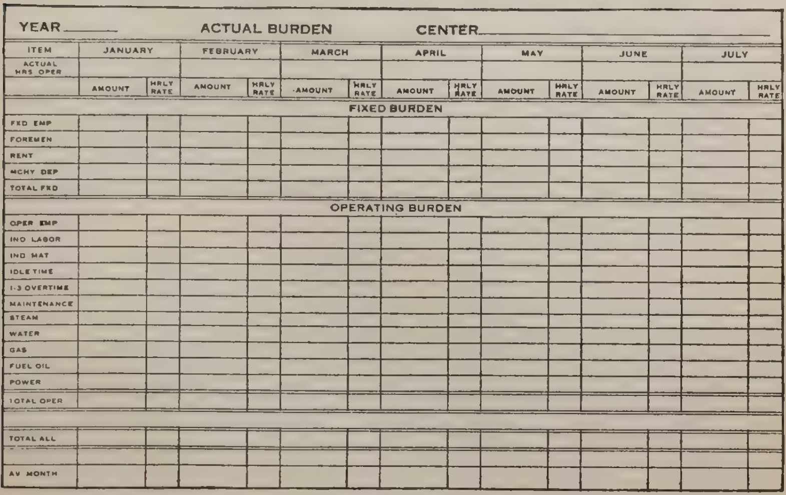
FORM 1.—Front.

DISTRIBUTION															
CENTER	HOURS	RATE	AM'T	EST NORMAL	CENTER	HOURS	RATE	AM T	EST NORMAL	CENTER	HOURS	RATE	AM T	EST NORMAL	
									TOTAL					

FORM 1.—Back.

operating labor, but not including their wages. In this way 12 cards accumulated for the year the total of all items charged to the 12 main expense classes.

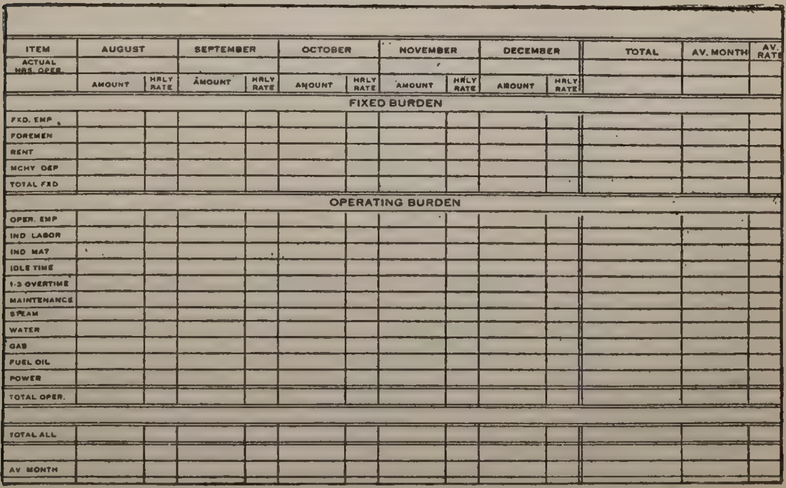
The totals accumulated on this series of cards were then allocated to burden centers, for each of which a card similar to Form 2, front and back, was prepared.



YEAR ______ ACTUAL BURDEN CENTER ______

ITEM	JANUARY		FEBRUARY		MARCH		APRIL		MAY		JUNE		JULY	
ACTUAL HRS OPER														
	AMOUNT	HRLY RATE	AMOUNT	HRLY RATE	AMOUNT	HRLY RATE	AMOUNT	HRLY RATE	AMOUNT	HRLY RATE	AMOUNT	HRLY RATE	AMOUNT	HRLY RATE
FIXED BURDEN														
FXD EMP														
FOREMEN														
RENT														
MCHY DEP														
TOTAL FXD														
OPERATING BURDEN														
OPER EMP														
IND LABOR														
IND MAT														
IDLE TIME														
1-3 OVERTIME														
MAINTENANCE														
STEAM														
WATER														
GAS														
FUEL OIL														
POWER														
TOTAL OPER														
TOTAL ALL														
AV MONTH														

Form 2.—Front.

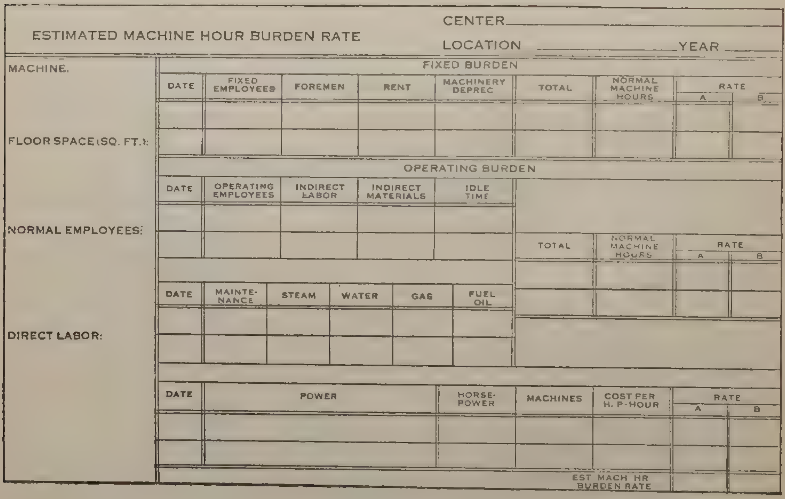


ITEM	AUGUST		SEPTEMBER		OCTOBER		NOVEMBER		DECEMBER		TOTAL	AV. MONTH	AV. RATE
ACTUAL HRS. OPER.													
	AMOUNT	HRLY RATE	AMOUNT	HRLY RATE	AMOUNT	HRLY RATE	AMOUNT	HRLY RATE	AMOUNT	HRLY RATE			
FIXED BURDEN													
FXD. EMP													
FOREMEN													
RENT													
MCHY DEP													
TOTAL FXD													
OPERATING BURDEN													
OPER. EMP													
IND LABOR													
IND MAT													
IDLE TIME													
1-3 OVERTIME													
MAINTENANCE													
STEAM													
WATER													
GAS													
FUEL OIL													
POWER													
TOTAL OPER.													
TOTAL ALL													
AV MONTH													

Form 2.—Back.

Each class of expense was allocated to these burden centers on some appropriate basis. Thus, Fixed Employees was charged to each center in proportion to the number of employees there working; Foremen was distributed among the centers supervised by the foremen in proportion to the number of employees in each. Rent was distributed on a square-foot basis, and Machine Depreciation was the actual depreciation computed on the equipment of that center. All operating burden charges contained the actual amounts incurred by each center; Operating Employees, Indirect Labor and Indirect Materials were specific charges to each center, as also was Maintenance; Steam, Water, Gas, Fuel Oil, and Power were all metered as closely as possible and allocated to each center as direct charges.

A center contained different machines, or different machine groups, for each of which a burden rate was desired; the charges thus gathered on Form 2 were, therefore, again subdivided on an appropriate basis and the proper charges for each machine or machine group were accumulated on cards similar to Form 3.



ESTIMATED MACHINE HOUR BURDEN RATE
CENTER
LOCATION YEAR

MACHINE.
FLOOR SPACE (SQ. FT.):
NORMAL EMPLOYEES:
DIRECT LABOR:

FIXED BURDEN
DATE | FIXED EMPLOYEES | FOREMEN | RENT | MACHINERY DEPREC | TOTAL | NORMAL MACHINE HOURS | RATE A B

OPERATING BURDEN
DATE | OPERATING EMPLOYEES | INDIRECT LABOR | INDIRECT MATERIALS | IDLE TIME
DATE | MAINTENANCE | STEAM | WATER | GAS | FUEL OIL
TOTAL | NORMAL MACHINE HOURS | RATE A B

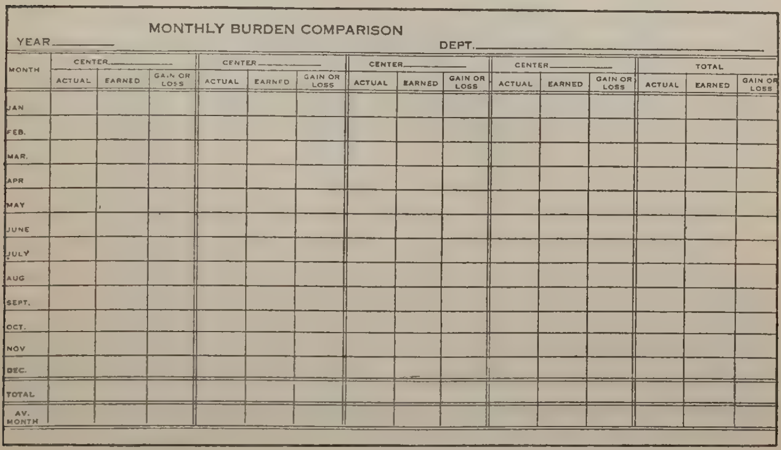
DATE | POWER | HORSE-POWER | MACHINES | COST PER H. P-HOUR | RATE A B

EST MACH HR BURDEN RATE

Form 3.

Here the actual machine rate was shown on the extreme right in three amounts, one for Fixed Burden, one for Operating Burden, and one for Power, the total of the three being given at the foot of the card. The letters "A" and "B" indicated two different rates computed at different times. The rate was used for two principal purposes, and in both cases a single total machine rate was used. This total, multiplied by the number of hours which the machine had been run during the period, gave the total amount of burden to be regarded as "earned burden" and to be charged to the product. The rate was also used in estimating costs and quoting prices for products made on that machine.

Form 4 furnished a comparison between the actual burden, as accumulated on Forms 1, 2, and 3, and the amount of earned burden, that is, the burden charged to product, as above described.



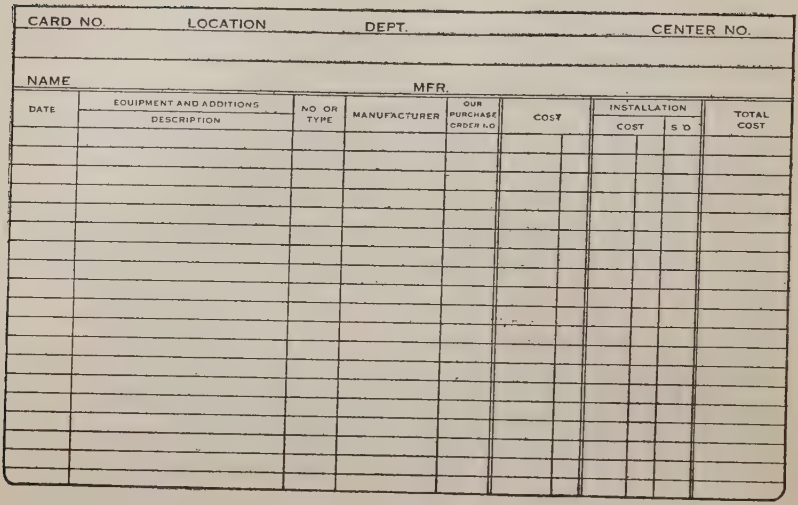
MONTHLY BURDEN COMPARISON

YEAR________ DEPT.________

MONTH	CENTER____			CENTER____			CENTER____			CENTER____			TOTAL		
	ACTUAL	EARNED	GAIN OR LOSS	ACTUAL	EARNED	GAIN OR LOSS	ACTUAL	EARNED	GAIN OR LOSS	ACTUAL	EARNED	GAIN OR LOSS	ACTUAL	EARNED	GAIN OR LOSS
JAN															
FEB.															
MAR.															
APR															
MAY															
JUNE															
JULY															
AUG															
SEPT.															
OCT.															
NOV															
DEC.															
TOTAL															
AV. MONTH															

FORM 4.

The forms illustrated were not the original forms devised for this purpose. Form 2 took the place of an older form in which the names of the months were arranged horizontally across the top of the card, front and back, and in which the items of expense were noted on the left-hand side. The principal reason for this change was to enable the column headed "Hourly Rate" to be added; in computing this rate it was easier to add the money columns vertically than to use the horizontal arrangement of the old card. The card reproduced as Form 3 combined two older forms in one; the first of these older forms contained the

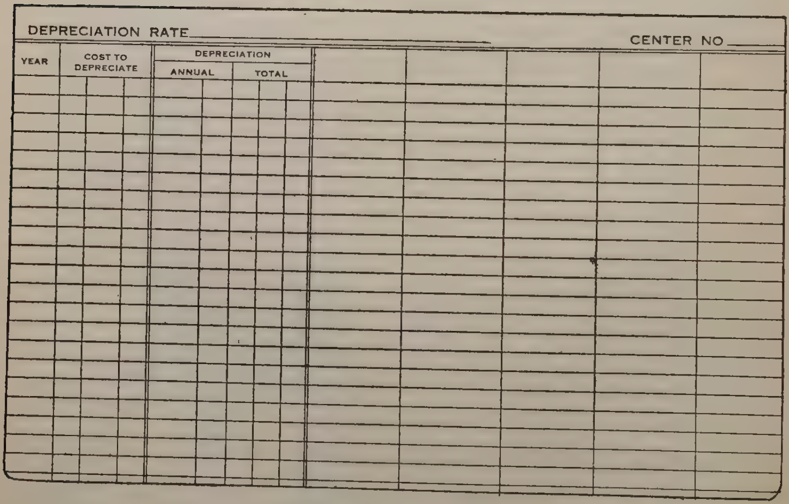


CARD NO. LOCATION DEPT. CENTER NO.

NAME MFR.

DATE	EQUIPMENT AND ADDITIONS	NO OR TYPE	MANUFACTURER	OUR PURCHASE ORDER NO	COST	INSTALLATION		TOTAL COST
	DESCRIPTION					COST	S O	

Form 5.—Front.



DEPRECIATION RATE

CENTER NO

YEAR	COST TO DEPRECIATE	DEPRECIATION						
		ANNUAL	TOTAL					

Form 5.—Back.

data regarding the basis of distribution of the various groups of expenses, that is, machine hours, floor space, normal employees, and direct labor. These, it will be seen, in the new arrangement were noted briefly on the left side of Form 3. The other information on the card was likewise arranged to permit a vertical addition of the several component parts of the rate in order to obtain the total machine rate. The different groups of expenses were also more distinctly set out than on the older card.

In conjunction with the foregoing records for burden, a card index record for plant and machinery was kept; Form 5, front and back, shows the design of this record.

In the General Ledger, three main accounts covered the plant and machinery. Machinery was an account that included the purchase price of all new machines; Installations was the second account, containing all costs of installing these machines in their proper places ready for operation; Plant Additions, which was the third account, included such special fittings or attachments to the main machines as it was desired to capitalize. The reason for this subdivision was that the company wanted to depreciate these three classes of assets at different rates.

Was the change from a labor-cost to a machine-hour basis for the distribution of burden a wise one?

Why should the machine-hour be expected to give more reliable results?

III

ACCUMULATION OF COST CONTROL DATA

A. ORDER COSTS, PROCESS COSTS, AND VARIATIONS

1. Waldron Paper Company—No. 6

COST LEDGER AND COST ACCOUNTS: WHAT COST RECORDS AND COST ACCOUNTS WERE NECESSARY IN THE WALDRON PAPER COMPANY?

The cost accounting department of the Waldron Paper Company kept a Cost Ledger, which was a book of final entry for all transactions occurring within the mill. As pointed out already, the general books of original entry were so ruled that entries relating to both financial transactions and cost transactions were made in them; the cost department did not therefore keep a separate set of journals. It did, however, keep Distribution sheets which gave detailed information about the various kinds and amounts of material used, which was a summarization of the material requisitions received and filled by the stores department. The Payroll sheets gave the detail of the credit entry in the Cash Book recording wages paid, and these furnished the cost department with information about the labor charges. The Burden Distribution sheets supplied the detail for the distribution of the credit entries made in the Cash Book during the month recording expenses paid.

The Cost Ledger contained two types of accounts: (1) Inventory accounts, either Raw Material, Work in Process, or Finished Stock, and (2) Burden accounts. These various accounts are discussed under appropriate titles in the succeeding paragraphs.

I. RAW MATERIAL ACCOUNTS

The Cost Ledger contained the following Raw Material accounts: Rags, Soda Pulp, Sulphite Pulp, Miscellaneous Pulp, Shavings, Outthrows, Rosin, Soda Ash, Tub Size, Fillers, Other Chemicals, Color, Coal, Wires and Felts, Plater Books, and Supplies. These accounts were debited from the Accounts Payable Register and credited from the Material Requisition Summary sheets. There was generally a balance remaining in each of these accounts at the end of each period which represented the value of goods still on hand.

The most important materials used were rags and pulp. The other materials mentioned were essential to paper production but were not used in as large volume as rags and pulp.

In the Cost Ledger there was a Stock Sheet for each type of raw material. A copy of this sheet is here given as Form 14.

In order that the cost department might have an adequate

STOCK LEDGER

Account No.

Date	Invoice No.	Explanation	Debit				Credit				Balance			
			Price	√	Quantity	Amount	Price	√	Quantity	Amount	Price	√	Quantity	Amount
		Forward— Debits												
		Credits												

Waldron Paper Co. No. 6

FORM 14.

BALED RAGS

Account No. Material Lot No.
Vendor Grade
Purchase Order Price F.O.B. Terms

Date Received	Bales	Lbs. Billed	Lbs. Received	Total Price	Discount	Freight	Cartage	Net Cost	Cost per Lb.

Used				On Hand			Used				On Hand		
Order	Bales	Lbs.	Cost	Bales	Lbs.	Cost	Order	Bales	Lbs.	Cost	Bales	Lbs.	Cost

Waldron Paper Co. No. 6

Form 15.—Front.

BALED RAGS

Date Received Material
Car No. Lot No.
Bales Total Weight

Bale	Weight	Bale	Weight	Bale	Weight	Bale	Weight
1		28		55		82	
2		29		56		83	
3		30		57		84	
etc.		etc.		etc.		etc.	
27		54		81		108	
Total							

Waldron Paper Co. No. 6

Form 15.—Back.

record of baled rags it also kept a detailed supplementary card for them in addition to the Stock Ledger Sheet. A copy of the card was presented as Form 15.

RAG INVENTORY

Shipper	Lot No.
Material	Grade

Date of Invoice	Number of Bales	Weight	Location	Date Received

Received		Used		Received		Used		Received		Used	
No.	Weight	Weight	Total	No.	Weight	Weight	Total	No.	Weight	Weight	Total
1				22				43			
2				23				44			
3				24				45			
4				25				etc.			
etc.				etc.							
21				42				63			

Waldron Paper Co. No. 6

FORM 16.

GENERAL INVENTORY CARD

Description			Account No.
Location	Unit	Maximum	Minimum

Received				Used					Balance	
Date	Order No.	Quantity	Amount	Date	Order No.	Quantity	Price	Amount	Quantity	Amount

Waldron Paper Co. No. 6

FORM 17.—Front.

Rags were bought in large quantities and there was one or more of these cards for every order.

In the rag room a corresponding card of rags was kept, as shown in Form 16.

For each of the miscellaneous raw material items the detailed card shown in Form 17 was kept in the storeroom.

The back of this card was identical with the front.

2. WORK IN PROCESS ACCOUNTS

There were two Process accounts carried on the Cost Ledger, namely, Dressed Rags in Process, and Paper in Process. Since a great many rags might be put through the Dressed Rags in Process account but not immediately taken into the Paper in Process account, the Cost Ledger contained an intermediate account called "Half Stuff." Thus, if rags were processed but not directly manufactured into paper, the following entry was made:

Half Stuff	$	
To Dressed Rags in Process		$

If, however, the rags processed were manufactured into paper directly, a different entry was made, thus:

Paper in Process	$	
To Dressed Rags in Process		$

On the other hand, if dressed rags were taken from the half stuff, and put into process in the paper-making department, a third entry was made:

Paper in Process	$	
To Half Stuff		$

In some cases dressed rags were taken both from the Dressed Rags in Process and Half Stuff accounts for one and the same order, in which case the following entry was made:

Paper in Process	$	
To Half Stuff		$
Dressed Rags in Process......		

These Process accounts were debited with Raw Material taken into process, Wages paid for labor used in processing operations, and Burden accumulated on such operations, as shown. The Process accounts were credited with amounts of paper finished, and in some cases where there was waste, with amounts of miscellaneous Pulp, Shavings, and Outthrows; accounts for these materials were debited at the time the Process accounts were credited.

(*a*) *Dressed Rags in Process*

The Dressed Rags in Process account was used to cover all rags from the time the bales were opened, and all shavings put through the cookers or the pulper from the time they were taken out of the shaving storage, until as half stuff they were washed and dumped into the drainers. This account was supported by Half Stuff Cost Sheets (Form 4) covering the bleaches, and by Inventory Cards (Form 16) covering any rags which were put into the bins after being opened.

(*b*) *Half Stuff*

The Half Stuff account covered the half stuff in the drainers after it was dumped from the washers and before it was furnished to the beaters. All half stuff dug and furnished to the beaters on any Furnish or Beater order as shown in detail on the Beater Reports, already presented, was summarized in pounds and entered on the corresponding Furnish Cost Sheet (Form 6).

(*c*) *Paper in Process*

The Paper in Process account covered all paper in process from the time it was furnished into the beaters until it was delivered into finished stock or shavings. It was supported by Furnish Cost Sheets, already given, Inventory Cards covering suspense amounts for shavings, and Lot Cost Sheets (Form 8).

A summarizing journal entry was made at the end of each period covering all charges on the Furnish Cost Sheets for the period. The total of the charges was debited to the Paper in Process account, with corresponding credits to Half Stuff and other inventory accounts to cover the materials used, and to the various burden center accounts for earned burden. A running total was also taken of the credits entered on the back of the

Furnish Cost Sheets, and checked against the total of the Furnish Cost entries on the Lot Cost Sheets for the same period.

A Suspense account, with proper Inventory cards, was used as a subsidiary of Paper in Process, to take care of the charges made for shavings in connection with regular production. This was necessary because it was impossible without considerable extra detail to keep track of such shavings by the individual lots of paper made. As shavings from various lots were weighed up in bulk and dumped into the shavings bins the Shavings account was debited with the quantities recorded on the Daily Trimmer Reports, already presented, extended at a fair market price for such material, and the same amount was credited to the Suspense account. This credit offset the charge previously made to the Suspense account for the computed amount of shavings. By this method the Shavings account always represented actual quantities on hand as determined by scale weight; at the same time the debit balances on the Lot Cost Sheets represented the actual amount of lots in process.

3. FINISHED STOCK

There was one Finished Stock account in the Cost Ledger; it was debited with the amount of paper completed and transferred to finished stores from the paper process centers, and was credited with the cost of the goods sold, the offsetting debit being made to Inventory Control—General Office, as explained in a previous case. The Finished Stock account balance at the end of each period represented finished stock remaining on hand.

This Finished Stock account covered all paper from the time it left the finishing room until it was sold; it included all finished papers put into stock, and also all papers shipped as soon as manufactured. It was debited from the journal entry summarizing the credits on the Lot Cost Sheets, and was supported by Inventory Cards, one card for each lot of finished papers on hand (Form 18).

These inventory cards were credited with all shipments of paper, as shown by the Sales Invoices. After the Sales Sheets were written up with cost of sales, they were sent to the finished-stock-inventory clerk for entry on the cards.

The entries on the Sales Sheets represented cost of regular

FINISHED STOCK CARD

Lot No. Grade Wm. Size-Weight Sub. No. Color

Total Sales, $ Fin. Weight Lbs.

Cost per Pound, Cts. Total Cost, $ Gross Gain, $ Gross Gain per Pound, Cts.

Dr.					Cr.					Gross Sales	Balance		
Date	Rms.	Price	Pounds	Amount	Date	Rms.	Pounds	Amount	Inv. No.		Rms.	Pounds	Amount

Lot No. Grade Watermark Size-Weight Color

Waldron Paper Co. No. 6

FORM 18.—Front and Back.

sales and formed the basis of a journal entry at the end of the period crediting Finished Stock, and debiting Cost of Regular Sales.

BURDEN ACCOUNTS

The Cost Ledger contained, in addition to the Inventory accounts, a Burden account for each operation. The operations were of two types, namely, direct operations and indirect operations, and the Burden accounts were divided in like manner.

There were 20 direct operation Burden accounts: (1) Raw Stock Handling and Storage, (2) Rag Preparation, (3) Rag Cooking, (4) Rag Washing, (5) Drainers and Stock Digging, (6) Paper Pulping, (7) Size Making, (8) Paper Machine No. 1, (9) Paper Machine No. 2, (10) Paper Machine No. 3, (11) Paper Machine No. 4, (12) Paper Machine No. 5, (13) Loft Drying and Jogging, (14) Calendering and Hot Rooms, (15) Pasting and Dampening, (16) Plating, (17) Sorting, (18) Trimming, (19) Wrapping and Sealing, and (20) Finished Stock Storage and Shipping. It has already been pointed out that these accounts were debited with actual burden costs taken from the Burden Distribution Sheet, and credited with standard burden rates on the production of the center. Any balance which might exist at the end of the period in any of these accounts represented "overabsorbed burden" if the balance was a credit, and "unabsorbed burden" if the balance was a debit; in either case the balances were closed out to the Inventory Control—General Office account. The general office then debited or credited Profit and Loss in the General Ledger.

In addition to the direct operation Burden accounts mentioned above, there were nine indirect or service operation Burden accounts. These were: (1) Water Supply, (2) Steam, (3) Power, (4) Maintenance, (5) Building Expense, (6) Case Making, (7) Trucking, (8) Hospital, (9) General Manufacturing. These accounts were redistributed on the Burden Distribution Sheet to the direct producing department by being credited and each direct producing department being debited with its proportionate share.

What is the relationship of the various Inventory reports and the Half Stuff Cost Sheet?

Through what books would the entries posting the content of the Half Stuff Cost Sheet, Furnish Cost Sheet, and Lot Cost Sheet go?

Is it sound to have a Finished Stock account on the Cost Ledger?

2. WALDRON PAPER COMPANY—NO. 7

PROCESS COST TRANSACTIONS: WHAT TRANSACTIONS TOOK PLACE DURING FEBRUARY RELATIVE TO MATERIALS, LABOR, AND BURDEN?

During the month of February the Waldron Paper Company produced a considerable amount of paper; the material, labor, and burden costs for this production are given under appropriate titles in the following pages.

MATERIAL COSTS

The materials used were determined by summarizing the various cost sheets which had been started and completed during the period.

MATERIALS USED

Department	Charged to	
	Paper in Process	Dressed Rags in Process
Rags	2,000	60,480
Sulphite Pulp	34,220	
Soda Pulp	12,000	
Miscellaneous Pulp	2,000	
Shavings	1,000	7,000
Tub Size	3,750	
Fillers	4,200	
Rosin	3,000	
Plater Books	1,025	
Color	550	
Chemicals	100	400
Soda Ash	....	800
Half Stuff	97,356	......
	161,201	68,680

During the period there were $2,500 in Outthrows, $4,750 in Shavings, and $1,500 in Broke shown as credits on the cost sheets. These Outthrows were credited to Dressed Rags in Process and the Shavings and Broke to Paper in Process. The debits were made to Outthrows, Shavings, and Miscellaneous Pulp (broke).

At the end of the period $2,025 of Dressed Rags still remained in process.

The Lot Cost Sheets showed that a total of $246,843 of paper had been finished and stored or shipped.

DIRECT LABOR COSTS

The direct labor charges for the month of February amounted to $18,676; this sum being made up from the following departmental charges:

Department	Number of Employees	Labor Cost
Rag Preparation	60	$ 4,670
Calendering and Hot Rooms	30	3,001
Plating	72	7,216
Sorting	39	3,789
	201	$18,676

A journal entry for the Cost Ledger was made charging the proper departments with these amounts and crediting the Inventory Control—General Ledger account for their total. Another journal was made for the General Ledger in which the Inventory Control—Paper Mill account was charged and the Wages and Salaries Accrued account was credited for the total amount.

BURDEN

Burden Distribution Sheet. Burden was accumulated on a basis of 13 four-week periods, the Burden Distribution Sheet used containing columns for the following items:

1. Fixed Charges
2. Indirect Labor
3. Supplies
4. Maintenance
5. Water Supply
6. Steam { Demand
7. { Consumption
8. Power
9. Building Expense
10. Hospital
11. General Manufacturing
12. Case Making
13. Trucking
14. Total Charges

The departments, both direct and indirect, were listed down the side of the sheet.

Fixed Asset Summary. The information for the "Fixed Charges" column in the Burden Distribution Sheet was computed from the following data:

		Value
Land		$ 52,300
Buildings		1,211,250
Building Fixtures		58,700
Machinery and Equipment		1,692,000
Belting and Small Tools		31,550
Automotive Equipment		49,200
Office Furniture and Fixtures		16,100
Water Rights		163,900
Average Inventories:		
Raw Materials	$249,100	
Work in Process	62,000	
Finished Goods	140,000	451,100
Total		$3,726,100

Taxes, Interest, Insurance, and Depreciation on the above were computed on a yearly basis, the rates being:

Taxes	1.5%
Interest	6 %
Insurance	0.1%
Depreciation on Buildings	2.5%
" " Fixtures	7.5%
" " Machinery	5.0%
" " Automotive Equipment	25.0%
" " Office Equipment	10.0%

The assets listed were divided into three parts for convenience and a fixed charge factor for each was computed thus:

	Value	Interest	Taxes	Insurance	Depreciation	Total
I. LAND AND BUILDING FACTOR:						
Land	$ 52,300	$ 3,138	$ 785			$ 3,923
Buildings	1,211,250	72,675	18,169	$ 1,211	$ 30,281	122,336
						$126,259
II. EQUIPMENT FACTOR:						
Building Fixtures	58,700	3,522	880	59	4,403	8,864
Machinery and Equipment	1,692,000	101,520	25,380	1,692	84,600	213,192
Belting and Small Tools	31,550	1,893	473	32		2,398
Automotive Equipment	49,200	2,952	738	49	12,300	16,039
Office Furniture and Fixtures	16,100	966	242	16	1,610	2,834
						$243,327
III. MISCELLANEOUS CHARGES:						
Water Rights	163,900	9,834	2,458			12,292
Average Inventories;						
Raw Material	249,100	14,946	3,737	249		18,932
Work-in-Process	62,000	3,720	930	62		4,712
Finished Goods	140,000	8,400	2,100	140		10,640
Other Insurance				24,831		24,831
						$ 71,407
	$3,726,100	$223,566	$55,892	$28,341	$133,194	$440,993

The various charges given for Interest, Taxes, Insurance, and Depreciation were brought on to the books each year with a standard journal entry, thus:

Inventory—Paper Mill	$223,566.00	
To Interest Charged to Cost		$223,566.00
Taxes Accrued	55,891.50	
Insurance Unexpired	28,340.90	
To Cash		84,232.40
Inventory—Paper Mill	133,193.75	
To Reserve for Depreciation		133,193.75

A standard periodic journal entry was then used to distribute these charges to the various departments.

The annual fixed charges for the three factors "Land and Buildings," "Equipment," and "Miscellaneous" were grouped into one total for each department. The departmental totals were then divided by 13, the number of periods used in a year, to obtain the periodic charge to be entered in the "Fixed Charges" column of the Burden Distribution Sheet, as shown next.

Department	Land and Buildings	Equipment	Miscellaneous	Annual Charge	Periodic Charge
1. Raw Stock Handling and Storage	$ 22,215	$ 1,015	$20,355	$ 43,585	$ 3,353
2. Rag Preparation	9,721	7,542	600	17,863	1,374
3. Rag Cooking	2,480	7,093	182	9,755	750
4. Rag Washing	2,012	8,201	249	10,462	805
5. Drainers and Stock Digging	5,309	10,333	153	15,795	1,215
6. Paper Pulping	961	2,269	87	3,317	255
7. Size Making	1,572	2,269	90	3,931	302
8–12. Paper Machines Nos. 1–5	13,025	82,225	1,356	96,606	7,431
13. Loft Drying	18,245	2,893	599	21,737	1,672
14. Calendering and Hot Rooms	5,281	11,753	532	17,566	1,351
15. Pasting and Ruling	1,304	972	122	2,398	184
16. Plating	1,569	7,100	919	9,588	738
17. Sorting and Counting	2,564	1,199	750	4,513	347
18. Trimming	555	3,432	115	4,102	316
19. Wrapping and Sealing	105	81	100	286	22
20. Finished Stock Storage and Shipping	15,466	592	9,376	25,434	1,956
21. Maintenance	1,716	2,811	722	5,249	404
22. Water Supply	311	17,255	....	17,566	1,351
23. Steam—In Buildings	....	18,767	943	23,689	1,822
Coal Storage	3,979				
24. Power	5,312	24,296	5,128	34,736	2,672
25. Building Expense	205	10,699	79	10,983	845
26. Hospital	1,205	201	33	1,439	111
27. General Manufacturing Burden	5,938	2,167	20,881	28,986	2,230
28. Case Making	793	82	85	960	74
29. Trucking	399	14,697	461	15,557	1,197
30. Unused Space and Equipment	1,433	1,244	....	2,677	206
31. Selling	759	628	30	1,417	109
32. Administration	1,825	1,511	7,460	10,796	831
Total	$126,259	$243,327	$71,407	$440,993	$33,923

The individual figures giving the periodic fixed charge total of $33,923 formed the debit to the standard periodic journal entry, the offsetting credits being to:

Interest Charged to Cost	$17,197	
Taxes Accrued	4,300	
Insurance Unexpired	2,180	
Reserve for Depreciation	10,246	$33,923

At the end of 13 periods these credits equaled the yearly charges.

Indirect Labor. The Indirect Labor charges and number of indirect employees in each department were as follows:

Department	Number Indirect Employees	Indirect Labor
Raw Stock Handling and Storage	9	$ 1,041
Rag Preparation	2½	409
Cooking	12½	1,552
Washing	18	2,136
Drainers and Stock Digging	12	1,394
Paper Pulping	6	687
Size Making	6	731
Paper Machines Nos. 1–5	75	12,421
Loft Drying	42	4,911
Calendering and Hot Rooms	10½	1,454
Pasting and Ruling	12	975
Plating	4½	671
Sorting	19½	3,880
Trimming	7½	1,012
Wrapping and Sealing	9	844
Finished Stock Storage and Shipping	6	841
Maintenance	27¼	4,726
Steam	21	2,739
Power	3¾	779
Building Expense	6	831
Hospital	2	291
General Manufacturing Burden	18	4,540
Case Making	6	729
Trucking	7	989
	343	$50,583

Supplies Used and Distributed. The Departmental Supply charges were:

Departments	Total Charges
Paper Machines Nos. 1–5	$ 2,692
Pasting and Ruling	291
Wrapping and Sealing	1,217
Finished Stock Storage and Shipping	405
Maintenance	1,411
Water Supply	425
Steam	8,427
Power	$ 2,893
Building Expense	213
Case Making	3,010
Trucking	275
	$21,259

The supplies, as determined by a physical inventory, which were charged to Paper in Process through the Burden Distribution Sheet as shown above were:

Wires and Felts	$2,500
Water Power Rent	2,780
Chemicals	375
Coal	8,232
Supplies	7,372
Total	$21,259

The Water Power Rent was disposed of by crediting the Water Power Rent Accrued account in the General Ledger.

Maintenance and Water Supply. The Repairs and Maintenance, and Water Supply costs amounted to $6,275 and $2,021, respectively, and were distributed to the various departments in the following manner:

Departments	Repairs and Maintenance	Water Supply
Raw Stock Handling and Storage	$ 80	
Rag Preparation	350	
Cooking	80	$ 101
Washing	425	1,010
Drainers and Stock Digging	70	
Paper Pulping	20	61
Size Making	80	61
Paper Machines Nos. 1–5	1,955	505
Loft Drying	80	
Calendering and Hot Rooms	490	
Pasting and Ruling	50	81
Plating	215	
Sorting	30	
Trimming	120	
Wrapping and Sealing	30	
Finished Stock Storage and Shipping	120	
Water Supply	245	
Steam	475	202
Power	865	
Building Expense	240	
Hospital	25	
General Manufacturing Burden	65	
Case Making	40	
Trucking	125	
	$6,275	$2,021

The distribution of the $6,275 Repairs and Maintenance charge was the estimated normal expense. The actual total charges for this period already made to Maintenance amounted to $6,541. The difference of $266 was charged to Reserve for Maintenance.

Steam Distribution. Steam costs were distributed upon the basis of demand and consumption. The demand charges related directly to the size of the steam plant, namely, the Fixed Charges, Indirect Labor, Miscellaneous Supplies, and Maintenance. The consumption charges were for coal and water. The steam plant operated only when there was no water to furnish power. Upon the average the steam plant was used 70 days per year, and upon this fact a standard daily charge amounting to $199.32 was made to the power plant for the steam supplied for each day that the steam power plant was used. In February there were 4 such days.

The total charges to the steam department amounted to $13,665, out of which $4,471 was distributed on the demand basis and $797 transferred to power on the basis given above (4 × $199.32) leaving only $8,397 to be distributed according to consumption percentages, as shown below.

Departments	Distribution of Periodic Demand Charges	Distribution of Periodic Consumption Charges (Except Power)	
Cooking	$ 152	3.4%	$ 286
Paper Pulping	6	0.1	8
Size Making	10	0.5	42
Paper Machines Nos. 1–5	1,496	69.7	5,853
Loft Drying	338	20.0	1,679
Calendering and Hot Rooms	51	0.7	59
Pasting and Ruling	25	0.3	25
Power	2,304	....	797
Building Expense	89	5.3	445
	$4,471	100.0%	$9,194

Power, Building Expense, and General Manufacturing. Power, Building, and General Manufacturing expenses were distributed to departments in the amounts as shown on the next page.

The Power and Building Expense percentages given were applied to the charges which had already been accumulated in the various departments to obtain the dollar amounts shown.

Departments	Power		Building Expense		General Manufacturing Expense
Raw Stock Handling and Storage	.3%	$ 31	18.1%	$ 481	$ 141
Rag Preparation	2.1	216	11.7	312	998
Cooking	.7	72	1.6	43	201
Washing	22.2	2,289	5.	133	291
Drainers and Stock Digging	.7	72	3.2	85	194
Paper Pulping	2.	206	.6	16	97
Size Making			1.6	43	97
Paper Machines Nos. 1–5	64.9	6,691	9.5	253	1,199
Loft Drying			14.1	376	670
Calendering and Hot Rooms	4.2	433	5.3	141	648
Pasting and Ruling	.2	21	1.2	32	194
Plating	1.6	165	1.7	45	1,222
Sorting			2.9	77	931
Trimming	.7	72	.6	16	119
Wrapping and Sealing			.1	3	141
Finished Stock Storage and Shipping	.2	21	15.	399	97
Steam					
Hospital			1.2	32	
General Manufacturing Burden			5.8	155	
Case Making	.2	21	.8	21	97
Trucking					112
	100%	$10,310	100%	$2,663	$7,449

Redistribution of Burden. General Manufacturing was distributed on the basis of the number of direct and indirect employees in each department as given on pages 218 and 221. There was some difficulty in closing this item because of the "vicious circle." Parts of the General Manufacturing Burden were to be distributed to Steam, Power, Maintenance, Building Expense, and Hospital departments, but all of these were already closed. The simplest way, therefore, to distribute General Manufacturing Burden was to consider the number of laborers in only those departments that remained open. Thus the total number of employees used was 466 (544 — 78) instead of 544 (Direct 201 and Indirect 343) because the employees in the following departments which had already been closed were not to be considered.

Department	*Employees*
Steam	21
Power	3¾
Maintenance	27¼
Building Expense	6
Hospital	2
General Manufacturing	18
	78

Burden was redistributed in the order in which the columnar headings were given. The charges to Hospital were closed to General Manufacturing; General Manufacturing was distributed on the basis of the number of direct and indirect employees in each department as given on pages 218 and 221, Case Making was transferred to Finished Stock Storage; and Trucking expense was distributed to Raw Stock Handling, Plating, Sorting, and Finished Stock Storage in percentages of 50, 5, 10, and 35, respectively.

The three items given at the bottom of the computation, namely, Unused Space and Equipment, Selling, and Administration, although given on the Burden Distribution Sheet, were not distributed to the producing departments. They were cleared through the Inventory Control—General Office account to the General Ledger, where they were charged to the Profit and Loss account.

Burden Rates. The burden rates used in the various departments and basis of their application were as follows:

Departments		*Rates*
Raw Stock Handling and Storage		$.20 per 100 lb.
Rag Preparation		.50 " " "
Rag Cooking		31.20 " bleach
Washing		.95 " machine-hour
Drainers and Stock Digging		.55 " 100 lb.
Paper Pulping		.50 " " "
Size Making	Rosin	.04 " pail
	Glue	.02 " lb.
Paper Machines Nos. 1–5		1.50 " 100 lb. 11.70 " machine-hour
Loft Drying		.70 " 100 lb.
Calendering and Hot Rooms		147% of direct labor
Pasting and Ruling	Pasting	$3.42 per machine-hour
	Ruling	1.65 " " "
Plating		43% of direct labor
Sorting (Including Counting)		145% " " "
Trimming		$1.30 per machine-hour
Wrapping and Sealing		2.00 " trimming-hour
Finished Stock Storage and Shipping		.70 " 100 lb.

These rates were applied to the proper figures in the various departments to obtain the Burden Earned amounts presented below. The Raw Stock Handling burden was applied to all bulk materials and also to the filler used. The burden charge for the drainers and stock digging center was applied on the basis of the pounds of bone-dry stock as determined by applying an average shrinkage factor to the quantity of dressed rags or shavings shown on the Beater Reports. The rate per pound on the paper machines was applied to the corrected loft weight.

Burden Earned. The Burden Earned during the month of February for the various departments is given next.

Departments	Amounts	
Raw Stock Handling	$ 6,336	
Rag Preparation	3,710	
Cooking	3,201	
Washing	6,966	$ 20,213
Drainers	3,211	
Paper Pulping	1,353	
Size Making	1,447	
Paper Machines Nos. 1–5	39,695	
Loft Drying	9,222	
Calendering	4,332	
Pasting and Ruling	1,919	
Plating	3,208	
Sorting and Counting	5,499	
Trimming	1,538	
Wrapping and Sealing	2,103	
Finished Storage and Shipping	8,993	82,520
	$102,733	$102,733

The Burden Earned was determined by summarizing the various cost sheets begun and completed during the period. The first four items were charged to Dressed Rags in Process and the others to Paper in Process.

Make the necessary journal entries to record the material and labor transactions.

Draw up the Burden Distribution Sheet.

Make the necessary journal entries to record the information contained in the Burden Distribution Sheet. The Redistributed Burden Centers (Water Supply through General Manufacturing Burden) should be debited and credited with the same amounts for the purpose of statistical record.

Post all of the entries now contained in the journal to the proper ledger accounts.

Close the books by journal entry and take off a trial balance of the General Ledger and the Cost Ledger.

3. Deven Corn Company—No. 1

MANUFACTURING ACCOUNTS: HOW MIGHT THE MANUFACTURING COSTS OF SEVERAL PRODUCTS DERIVED FROM CORN BE EXPRESSED IN THE ACCOUNTS?

The problem of arranging a series of accounts which would reflect the costs and inventory status of a series of products, all derived from corn, was the main concern of the cost department of the Deven Corn Company. The primary expenses could be allocated to the principal departments and products with some approach to exactness, but the subsequent redistributions, and the apportionment of costs between different products made in the same department, occasioned a considerable amount of trouble, and required much care on the part of the chief accountant. For purposes of illustrating the situation most effectively, the following data are supplied as to the accounts and methods used in keeping them.

The Processing accounts, with the balances of those containing inventories, were as follows on September 1, 1928:

Boiler House	......
Engine House	......
General Expense	......
Sugar Refinery	......
Repairs	......
By-products Account	$ 60,000
Wet Starch	20,000
Powdered Starch	12,000
Prepared Starch	......
Dextrine	......
Glucose	12,000
Sugar	5,000
	$109,000

During the month manufacturing expenses were incurred as follows:

Coal Used:	
In Boiler House	$30,000
In Sugar Refinery	1,200

The analysis of the direct labor payroll was as follows:

Boiler House	$ 3,500
Engine House	800
Sugar Refinery	600
By-products	7,500
Wet Starch	15,000
Powdered Starch	3,500
Prepared Starch	1,500
Dextrine	2,700
Glucose	4,000
Sugar	8,000
	$47,100

Indirect labor of various types amounted to:

Officers' Salaries	$ 6,000
Office Salaries	8,000
Repair Labor	13,500
	$27,500

Supplies were used as listed:

Boneblack for Sugar Refinery	$ 7,700
Repair Materials	13,000
Supplies used for By-products	8,000
Used in Wet Starch Department	1,000
Powdered Starch	150
Prepared Starch	1,200
Dextrine	3,500
Chemicals used in Glucose Dept.	10,000
Chemicals used in Sugar Dept.	11,000
	$55,550

There were 500,000 bushels of corn at an average cost of 96¢ per bushel put into process in the wet starch department.

Other expenses included:

Office Expense	$ 4,000
Miscellaneous Expense	1,800
Administrative Expense Connected with By-products	7,600
Selling Expense for By-products	13,000
	$26,400

The total repair expenses were allocated to the departments on the basis of records kept for the repair work done in them; the charges were as follows:

Boiler House	$ 1,500
Engine House	400
Sugar Refinery	400
Residues	7,000
Wet Starch	11,800
Glucose	1,000
Sugar	2,300
Powdered Starch	1,400
Prepared Starch	200
Dextrine	500
	$26,500

Distribution of the boiler-house charges was made by the plant superintendent, who estimated the steam consumption of the several departments at the end of each month, taking into account both the capacity and the current production of the departments. The resulting charges to departments were:

Engine House	$18,900
Sugar Refinery	2,400
By-products: Feed, Oil and Meal	2,100
Powdered Starch	2,000
Prepared Starch	400
Dextrine	700
Glucose	2,500
Sugar	6,000
	$35,000

The engine-house costs also were distributed monthly by the superintendent on the basis of the estimated power consumption of the departments, as follows:

Wet Starch	$16,000
Glucose	1,800
Sugar	2,300
	$20,100

These distributions for the boiler house and the engine house were apparently made only very approximately by the plant superintendent, since upon examination it transpired that no new figures had been supplied for more than a year; each month the plant superintendent turned in the report "same as last month."

General Expense, which included Officers' Salaries, Office Salaries, Office Expenses, and Miscellaneous Expenses, was distributed to product accounts in proportion to the pounds of product produced, excluding by-products. No direct charge was made to dextrine, since that product was made from powdered starch and it was necessary to avoid a duplicate charge.

The sugar refinery department was a filtration process for the early stages of manufacture of glucose and sugar. This department was always credited with the amount of spent boneblack which resulted from it, and which in September amounted to $2,500. The balance of the account was then apportioned between glucose and sugar in proportion to the pounds made of each.

Sales of by-products for the month were as follows:

Gluten Feed	$150,000
Crude Oil	65,000
Oil Meal	13,000
	$228,000

An inventory valued at $55,000 remained on hand in this department at the end of the month. It was customary to transfer the net proceeds of this department to the Wet Starch account as a credit before determining the net costs of other products.

Transfers were made from the wet starch department as follows:

To Powdered Starch	$ 70,000
To Prepared Starch	10,000
To Glucose	120,000
To Sugar	160,000
	$360,000

The balance of the Wet Starch account was then the inventory in process at the end of the month.

Powdered starch was transferred to the dextrine department at a value of $23,400, and powdered starch worth $58,500 was finished during the month. The balance of the account was then the month-end inventory in process.

In the prepared starch department, batches were put through and finished very quickly so that there was no inventory in process at the end of the month; the total charges represented the value of goods made during the month. The same thing was true of the dextrine department.

In the glucose department, on the other hand, there was a final inventory of $10,000, and in the sugar department an inventory of $4,000; the balance of these accounts represented the cost of goods finished during the month.

PRODUCTION DURING SEPTEMBER, 1928

	Pounds
Powdered Starch—Net	1,000,000
Prepared Starch	500,000
Dextrine	2,500,000
Glucose	6,000,000
Sugar	8,000,000
	18,000,000
Residues:	
Gluten Feed	4,000,000
Crude Oil	400,000
Oil Meal	600,000
	23,000,000

A gross total of 18,000,000 lbs. of starch was made, of which 3,500,000 lbs. was converted into powdered starch, 500,000 lbs. into prepared starch, 6,000,000 lbs. into glucose, and 8,000,000 lbs. into sugar.

Of the 3,500,000 lbs. of powdered starch, 2,500,000 lbs. was converted into dextrine, the balance being sold or stored as powdered starch.

Prepare the Process accounts for the month of September for the Deven Corn Company in accordance with the data given.

Have you any comment or criticism on the accounting processes described?

Construct a General Ledger Control account to cover the data as given in this problem for the Cost Ledger accounts.

Would the Control account, in actual practice, coincide with the one referred to in the last question? Explain your answer.

4. BRUNO IRON WORKS

COST DATA: HOW SHOULD COST DATA BE SUMMARIZED?

The Bruno Iron Works had a cost system which provided for the charging of Materials, Labor, and Burden to the various departments and products, upon a basis which gave accurate debits to these accounts. There was, however, no regular means for crediting the Manufacturing account for finished products, nor, consequently, for giving an accurate book inventory of work in process. During the last few years the company had several times changed its methods of summarizing the cost figures, and working out the inventory at the end of the period.

The original method may be illustrated briefly by the following figures:

	Weight	Amount	Cost per Pound
Inventory in Process, Beginning Input:	100,000	$ 5,000	$0.05
Material	200,000	4,000	0.02
Labor	....	2,000	0.01
Burden	....	6,000	0.03
Total Inventory and Input	300,000	$17,000	$0.0566
Credit Output Finished	200,000	11,333	0.0566
Balance, Final Inventory	100,000	$ 5,667	$0.0566

Evidently this method placed the same value per pound upon the Work in Process inventory at the end as upon the finished output, though the inventory included goods in all stages of completion.

An attempt was therefore made to get more accurate figures by weighting the final inventory as if it were, on the average, only half completed. The precise method of doing this was shown in detail in the "Procedure for Computing Work in Process Cost Sheets."

Procedure for Computing Work in Process Cost Sheets

1. Analyze current month charges on ledger sheets as to Material, Labor, and Expense.

    (*a*) Prove figures entered in their respective columns by adding across, and total should be the difference between debits and credits on ledger sheets.

2. Add current month input to two previous months' input plus inventory first of quarter.

    (*a*) Prove figures by adding across, and total should equal the addition of the total column for these same figures.

3. Compute pound cost of "Total Material" column by dividing total weight by total value.

    (*a*) Prove figures by multiplying back.

4. Add weight of current month's transfers to total weight of previous two months' transfers, arriving at weight of three months' transfers.

5. Multiply total weight of transfers by pound cost arrived at in No. 3 operation, giving the material cost for total three months' transfers.

6. Subtract total of "Value in Material" column of previous two months' transfers from total of three months' transfers, arriving at cost of current month's transfers.

7. Compute material cost per pound for current month's transfers by dividing value of current month's transfers by the weight of current month's transfers.

8. Subtract weight and value of total three months' transfers from weight and value of total arrived at in No. 2 operation, arriving at inventory of weight and material value of inventory. The pound cost is the same as the pound cost of total three months' transfers.

9. Divide inventory of weight at end by 2, and add to weight of total three months' transfers for figure to use in computing average labor expense pound cost.

10. Divide total of labor in process, as arrived at in operation No. 2, by the above figure (transfers plus 50% of inventory), arriving at average labor cost per pound.

11. Multiply weight of total three months' transfers by this labor cost per pound, arriving at labor cost for total three months' transfers.

12. Subtract labor cost of previous two months' transfers from labor cost of total three months' transfers, arriving at labor cost for current month's transfers.

13. Divide labor cost for current month's transfers by weight of current month's transfers to arrive at labor cost per pound of current month's transfers.

14. Subtract labor cost of three months' transfers from total labor cost (as per operation No. 2), arriving at inventory of labor in process.

15. By dividing inventory of labor in process by weight of inventory it should give 50% of the pound cost of total three months' transfers.

16. Divide total of expense in process, as arrived at in operation No. 2, by the total transfers plus 50% of inventory (operation No. 9) to arrive at average expense cost per pound.

17. Multiply weight of total three months' transfers by this expense cost per pound, arriving at expense cost for total three months' transfers.

18. Subtract expense cost of previous two months' transfers from expense cost of total three months' transfers, arriving at expense cost for current month's transfers.

19. Divide expense cost for current month's transfers by weight of current month's transfers to arrive at expense cost per pound of current month's transfers.

20. Subtract expense cost of three months' transfers from total

expense cost (as per operation No. 2), arriving at inventory of expense in process.

21. By dividing inventory of expense in process by weight of inventory it should give 50% of the pound cost of total three months' transfers.

22. Add material, labor, and expense values of current month's transfers and extend in "total value" column.

23. Add total value of current month's transfers to total value of previous two months' transfers.

(*a*) Prove total arrived at by adding across the material, labor, and expense values of three months' transfers.

24. Subtract total value of three months' transfers from total value of three months' input plus inventory first of quarter (operation No. 2), arriving at total inventory value.

(*a*) Prove figure arrived at by adding across the material, labor, and expense values of inventory at end.

25. Add material, labor and expense pound costs of current month's transfers and extend in "Total Pound Cost" column.

(*a*) Prove figure by multiplying weight of current month's transfers by total cost per pound, which should give total value for current month's transfers.

26. Add material, labor, and expense pound costs for three months' transfers and extend in "Total Pound Cost" column.

(*a*) Prove figure by multiplying weight of three months' transfers by total cost per pound, which should give total value for three months' transfers.

27. Add material, labor, and expense pound costs of inventory and extend in "Total Pound Cost" column.

(*a*) Prove figure by multiplying weight of inventory by total cost per pound, which should give total value of inventory.

28. Other pound costs on Cost Sheet should be computed and proved across the same as for current and three months' transfers and inventory.

Taking the figures shown in Table 1, fill in the remaining spaces by computing appropriate figures for Material, Labor, Expense, and total cost for the Transfers Out—Current Month,

TABLE I

COST SHEET—MONTH OF NOVEMBER, 1922

	NET MATERIAL IN PROCESS			LABOR IN PROCESS		EXPENSE IN PROCESS		TOTAL COST	
	Weight	Value	Value per Pound	Amount	Cost per Pound	Amount	Cost per Pound	Amount	Cost per Pound
Inventory—September 1..........	219,539	21,287.38	.096964	3,014.05	.013729	5,306.48	.024171	29,607.91	.134864
Input—Month of September.......	121,022	12,043.87	.099518	2,710.89	.022400	4,835.43	.039955	19,590.19	.161873
Input—Month of October..........	90,150	6,786.58	.075281	3,024.80	.033553	6,763.05	.075020	16,574.43	.183854
Input—Month of November.......	165,832	12,030.12	.072544	2,739.54	.016520	4,980.27	.030032	19,749.93	.119096
Total..........................	596,543	52,147.95	.087417	11,489.28	.019260	21,885.23	.036687	85,522.46	.143364
Transfers Out—Month of September	92,666	9,065.61	.097831	2,421.36	.026130	4,258.37	.045954	15,745.34	.169915
Transfers Out—Month of October...	78,094	6,310.39	.080805	2,610.06	.033422	5,541.16	.070955	14,461.61	.185182
Total..........................	170,760	15,376.00	.090045	5,031.42	.029465	9,799.53	.057388	30,206.95	.176898
Transfers Out—Current Month.....	87,907								
Total Transfers..................									
Inventory at End.................									

Total Transfers, and Inventory at End, in accordance with the instructions given.

Since this cumbersome procedure had evoked much criticism, the company was looking for a more satisfactory method. What would you recommend?

What changes in the regular current accounting methods of the Bruno Iron Works would remove any necessity for the above calculations? How feasible do you consider your suggestions (*a*) in a plant making 35 different articles, (*b*) in a plant making several thousand articles?

5. Forrest Electrical Company

ORDER COSTS: WHAT METHOD OF ACCOUNTING FOR ORDERS PASSING THROUGH A PLANT CAN BE USED TO DETERMINE THE COSTS OF THE ORDER?

I. Nature of Company's Business

The Forrest Electrical Company manufactured small motors and sundry electrical apparatus. Its products could be conveniently grouped into two classes: (1) products of standard design and (2) products of special design. Each class is described in the succeeding paragraphs.

The products of standard design comprised the greater portion of the company's production and therefore enabled it to produce largely for stock. Usually, in producing for stock, the company did not produce the completed unit, but manufactured only the individual parts necessary to build a motor or other electrical apparatus. The complete unit was turned out only upon receipt of a customer's order at which time the parts were requisitioned from stock and the motor or apparatus was assembled. This procedure was followed mainly because it was easier to store parts than motors.

The products of special design comprised the smaller portion of the company's production and were generally made according to customers' specifications. Occasionally sundry parts from standard stock could be used in these orders. In most cases, however, special orders required special parts throughout, which necessitated individual production. After all of the necessary parts had been produced, the special motor or apparatus was assembled.

II. Description of the Company's System

The company's system of accounting in its entirety was elaborate and complicated, and too comprehensive to be presented in one problem. To simplify the presentation, and still give a fair picture of what took place, the considerations of the accumulation of costs of material, labor, and overhead are confined to assembly of units. Little or no attention is given to the accumulation of production costs of the individual parts which are used in assembly. The description of the system is divided into three sections, one on each of the elements of costs.

A. Material

The materials used in assembly were the individual parts which had been manufactured and placed in stock. A perpetual inventory was kept for these parts and they were issued only on proper requisition from production departments. Materials were priced at standard prices, principally to simplify the computation of material costs. When an invoice was received, a sticker was attached to it on which an analysis of the purchase price was made; materials were taken into stock at standard prices, and variations were entered immediately in an account in the General ledger, and called "Loss and Gain on Purchases."

When a sales order was received, a copy of it was sent to the engineering department, where it was checked to determine whether the units called for were of standard or special design. If the order was for units of standard design, the planning department issued two authorizations. One was an Assembly Order (Form 1) which authorized the factory to assemble a designated type and number of units. The other was an Assembly Parts List (Form 2), which was used by the various productive departments as a single requisition to obtain the necessary parts to make up the units called for by the Assembly Order. A sample of each of these authorizations is given on the following pages.

Sometimes it happened that certain standard parts were not in stock or that a particular order for a unit of more or less standard design called for one or more special parts. In these cases a Production Order (Form 3) was issued which authorized the production of the parts not in stock or the special parts needed.

If some mistake or mishap occurred which caused the products being manufactured under the Production Order to vary from the specifications, a new order was issued. This order was called a Correction Production Order and was identical with the Original Production Order, except in name, and a reference number to relate it to the original Production Order under which it was issued.

B. Labor

The Forrest Electrical Company paid productive labor on three different bases, namely, straight hourly rate, straight piece rate, and in some cases a guaranteed hourly rate with a bonus for high production. The type of work determined the method of wage payment. Only the last of the three methods requires an explanation. To figure the bonus a piece rate was established

ASSEMBLY ORDER

Product	Customer
Date	No. of Sheets
Sheet No.	Approved by
Shipping Order No.	Assembly Order No.
Product No.	Class
Type	Size

Number of Pieces This Order	Name of Part	Piece No.	Drawing No.	Product or Requisition Order No.	Quantity Delivered	Unit Cost	Unit	Total Cost

Forrest Electrical Co.

Form 1.—Front.

LABOR AND OVERHEAD

Order No.

Dept.	Date	Key No.	Hours	Wage Rate	Labor	Overhead Rate	Overhead	Total	Remarks

SUMMARY

Dept.	Hours	Material	Labor	Overhead	Total	Remarks

Total Cost

Forrest Electrical Co.

FORM 1.—Back.

for each job. The number of good pieces completed on a job was multiplied by the predetermined piece rate to establish the standard labor cost. To determine the workman's wages on the guaranteed wage basis the number of hours worked on the job

ASSEMBLY PARTS LIST

Product	Customer
Date	No. of Sheets
Sheet No.	Approved by
Product No.	Class
Type	Size

Number of Pieces for One	Pieces for Order	Name of Parts	Piece No.	Drawing No.	Pattern No.	Standard Cost	
						Each	Total

Forrest Electrical Co.

FORM 2.

was multiplied by the workman's hourly rate. If the standard labor cost as established by the piece rate was larger in amount than the hourly wages computed on the guaranteed basis, the man was paid the difference as a bonus. If, on the other hand, the standard labor cost was less, the workman was paid his regular hourly wages. Losses were not deducted from bonuses earned. The Labor Ticket (Form 4) used to gather labor cost of the various jobs is presented.

The Labor tickets were collected daily and sorted by key or employee number. The total hours of day work and the total hours of piece work were then entered on the Employee Day Record and Bonus Statement (Form 5), which was a daily and weekly summary of each man's work on both day and piece basis.

The column headed "Day" under each day of the week was for the number of hours worked on straight day work. The column headed "Pc." contained the number of pieces made each day if the man was on straight piece work without bonus. If he was on the guaranteed hourly minimum with bonus, this column contained the number of hours worked each day. These figures were accumulated in the "Total" column at the right, and

PRODUCTION ORDER

Product
Customer
Piece
Date
Issued by
Approved by
Shipping Order No.
Prod. Order No.
Piece No.
Drawing No.
Pattern No.

From Department	To Department	Material Required	Production or Requisition No.	Material Cost	

Department		Operations	Time Allowance	Machine and Tools to Be Used

Forrest Electrical Co.

Form 3.—Front.

LABOR AND OVERHEAD

Order No.

Dept.	Date	Key No.	Hours	Wage Rate	Labor	Overhead Rate	Overhead	Total	Deliveries	
									Date	Quantity

Dept.	Hours	Material	Labor	Overhead	Total	Remarks
		Total Cost				

Forrest Electrical Co.

Form 3.—Back.

the man's weekly wage at the guaranteed hourly minimum was computed. Then the amount of bonus earned, as computed on the Statement of Completed Piece Work Jobs and Bonus Earned was brought over in one total and inserted in the "Bonus" column. On account of the work involved in computing bonuses, this part of the remuneration was always one week late; hence, the amount a man received under this system was his hourly wage for the current week plus the bonus, if any, for the previous week.

The form of this record is given on page 244.

The computation of the bonus was somewhat more difficult than the computation of the workmen's piece or day wages, since the bonus could not be determined until the particular job was completed. A job which was started in one week might not

LABOR TICKET

Dept.	Machine No.	Date
Key No.	Name	
Assembly Ord. No.		Production Ord. No.
Operation		Piece
Started	Stopped	Hours
Hour Rate	Piece Rate	Pieces

Hours × Rate = Day Wages			Loss		
Pieces × Rate = Piece Wages			Bonus		

Approved by

Forrest Electrical Co.

Form 4.

be completed until the following week, so that a workman received his bonus one week later. In order that there might be no misunderstanding between the workmen and the company over the bonus paid, the company made up a slip (Form 6) each week and placed it in the workmen's pay envelope.

Bonuses were added to the employee's regular wage, and the total amount was charged to Goods in Process. In those cases where a workman failed under the piece rate to make his guaranteed hourly rate, the guaranteed wage was charged to Goods in Process. No special cognizance was taken in the company's accounts of the loss due to guaranteeing wages.

To obtain the Payroll for the period, the totals were taken from the Employee Pay Record and Bonus Statement and accumulated on the Payroll Sheet (Form 7) which is given on page 246. This sheet was made up on Thursday of each week.

C. Overhead

The company had a complete and adequate system of distributing burden to the productive departments. Within the departments, burden was distributed upon the direct-labor-hour basis.

EMPLOYEE DAY RECORD AND BONUS STATEMENT

Key No. Dept.

Rate per Hour

Name Rate per Piece

Week Ending	Monday			Tuesday			Wednesday			Thursday			Friday			Saturday			Total						
	Hours		Amt.	Hours		Amt.	Hours		Amt.	Hours		Amt.	Hours		Amt.	Hours		Amt.	Hours			Amount			
	Day	Pc.		Day	Pc.		Day	Pc.		Day	Pc.		Day	Pc.		Day	Pc.		Day	Pc.	Total	Day	Pc.	Bonus	Total
																								*	

* Bonus figures are entered in black; loss in red. Forrest Electrical Co.

FORM 5.

STATEMENT OF COMPLETED PIECE-WORK JOBS AND BONUS EARNED

Key No. Name

Order No.	Piece, Specification or Drawing No.	Operation	Number of Pieces Completed	Piece Rate	Piece-work Earnings	Total Number Hours on Piece Work	Hour Rate	Hourly Earnings on Piece Work Job	Bonus or Loss
									*
		(Only Face Side Used on This Statement.)							
			Total						

Forrest Electrical Co.

* Bonus figures are entered in black; loss in red.

Form 6.

Because of the nature of the Forrest Electrical Company's business, developmental, shipping, and packing costs were high. Consequently, instead of including these items in the hourly rates for burden, they carried their own individual percentage rates, which were figured on and added to the total factory cost.

COST LEDGER CONTROL

The factory of the Forrest Electrical Company was treated as a separate department of the business. A Factory Ledger was kept which contained all the Raw Material accounts, the Work in Process accounts, the Finished Parts accounts, the Labor accounts, and Burden accounts. This ledger was self-balancing, because it contained General Ledger Control accounts which carried the credits for the offsetting debits to the accounts already mentioned. A Factory Ledger Control account was kept in the

PAYROLL

No. Week Ending

Key No.	Name	Day	Piece	Bonus	Total
	(Only Face Side Used on This Sheet)				
	Total				

Forrest Electrical Co.

Form 7.

Financial books at the main office, which was always kept in agreement with the General Ledger Control account on the factory books.

III. Transaction Presented

The Sales Order, shown on next page, was received.

The Standard Factory Cost on one HC-63 motor was $22.25.

To produce the motors required to fill the Sales Order (Form 8), the following factory orders were necessary: Assembly Order No. A-64321, and, under that, Production Order Nos. P-76288, P-76287, and Correction Order No. C.P. 77858.

A. Material

I. Assembly Order No. A-64321

On July 2, 1924, the factory planning department issued Assembly Order No. A-64321 to start production on the motors called for in Sales Order No. 16357A. The following material

THE FORREST ELECTRICAL COMPANY

Sold to Avery-Hughes & Co., Cincinnati, Ohio

Date Received	Date Entered	Agent's Order No.	Assembly Order No.	Billed	Our No.	Checked		Customer's No.
						Price	Credit	
6–28–24					S-16,357-A			

Ship to: Above By — Freight

	25	HC-63, $\frac{1}{4}$ hp., single-phase, a.c. Motors, open type, 110 volts, 60 cycle, 1150 r.p.m. ring oilers, with slotted feet. No pulleys. Rotation counterclockwise face cut-out end. Above constructed in accordance with sales specification No. 615.

Sheet and Line No.	Account No.	Shipping and Losses	Standard Development	Cost of Sales
Total				

Pk'g. Ship No.	B-L No.	Date Shipped	By	Articles	Dept.	File	No.	

Forrest Electrical Co.

Form 8.—Sales Order.

was required: (1) 25 sets of mechanical parts per Standard Parts List HC-63, which is given below.

STANDARD PARTS LIST HC-63

For HC-63 Standard Motor
Oil Bearing—Slotted Feet

Number of Parts for One	Name	Part Number	Standard Cost per 100 Units	
1	Front Case	8556	403	46
1	Back Cap	12466	130	95
4	“ “ Screws	2487		21
1	Terminal Board Complete	8220 NP	25	81
2	“ “ Screws	332	1	15
2	“ “ Riser Washers	8313	1	50
4	Cobb Clips	8186 NP	1	15
1	Bearing —(Front)	5904	33	00
1	“ —(Back)	8572	40	00
2	“ Retaining Screws	4412	1	50
2	Oil Rings	8489	2	50
2	Oil Well Covers	8559	4	00
2	End Play Washers	249		12
2	Stator Retaining Screws	2496		062
2	“ “ “ Washers	326		15
2	Brusher, Springs, Washers, Pigtails	8221	14	00
2	Brush Holder Caps	8339	4	20
2	“ “ Shells	8223 NP	13	00
2	“ “ Lead Clips	8162 NP	1	00
4	“ “ Washers	8302		30
2	“ “ Hex. Nuts	7211	2	00
1/4″	“ “ Mica Washers	8298	12	30*
2	“ Mica Bushing	8299	1	48
2	Pipe Plugs	4601	1	34
1	Name Plate	52351 NP	3	46

* $12.30 per 100″.

1—A—Production Order No. P-76288. Production Order No. P-76288 was issued July 3, 1924, under the above assembly order. This Production Order called for 25 Shaft and Rotor Assemblies which were not in stock. The material needed to fill this order was as follows:

25 Rotors 37 Bars No. 5 Copper Piece No. 8707—From Dept. 5.
25 Shafts B/P 32540—From Dept. 5.
25 Cutouts (Set –0– 900 RPM) Piece No. 8493.
25 Fans—Piece No. 52137.

These parts were to be delivered to Dept. 17, where the following operations were to be performed: Rough Turn Rotor, Press in Shaft, Mount Cutout and Fan, Straighten Shaft, Finish Turn Rotor and Balance. After these operations the material was to be inspected and delivered to Stores No. 3.

I—B—Production Order No. P-76287. Production Order No. P-76287 was issued on July 3, 1924, under Assembly Order No. A-64321. This production order called for:

> 25 HC-63 Stators—Engineering Specifications No. 9547, Lead Diagram No. C-90303, which were not in stock.

The material required to fill this order was as follows:

25 Stator Cores—Piece No. 10162
56 lbs. 4 oz. No. 20 E.C. wire.
12 lbs. 8 oz. No. 22 E.C. wire.

All of these were to be taken from Dept. 5 to Dept. 21.

Only one operation—namely, winding—was to be performed in Dept. 21. After the operations were completed, the goods were to be delivered to Stores No. 3.

I—C—Correction Order No. C.P. 77858. During the process of manufacture a ground developed in one of the stators and it was necessary to issue Correction Order No. C.P. 77858, which was issued on September 3, 1924. It read as follows:

> Repair Ground—Work to be done in Dept. 21 and article to be delivered to Dept. 24.

A summary of Material Requisitioned and Issued on Assembly Order No. A-64321 and its supplementary production orders is given below.

Date of Issue	Name	Piece No.	To Dept.	From Dept.	No. of Units	Unit Cost		Total Cost		Assembly or Prod. Order
7–2–24	Set Parts per List —HC-63				25	7	42	185	62	A–64321
7–2–24	Stator Cores	10,162	21	5	25			58	75	P–76287
	No. 20 E. C. Wire		21	5	53.69 lbs.			22	34	P–76287
	No. 22 E. C. Wire		21	5	16.61 lbs.			7	44	P–76287
7–3–24	Rotors—37 Bars No. 5 Copper	8,707	17	5	25			41	25	P–76288
	Shafts	32,540	17	5	25			16	20	P–76288
	Cutouts Set (0–900) RPM	8,493	17	5	25			36	75	P–76288
	Fans	52,137	17	5	25			5	25	P–76288

B. Labor

An analysis of the job ticket applying to Assembly Order No. A-64321 and its supplementary production orders is given below.

DAY WORK

Dept.	Date	Key No.	Hours	Wage Rate	Labor		Assembly or Production Order No.
17	7-21-24	575	1¾	60	1	05	P-76288
17	7-21-24	929	2¼	75	1	69	"
17	7-26-24	575	1½	60		90	"
17	7-26-24	929	½	75		38	"
21	7-26-24	723	2½	44	1	10	P-76287
17	7-28-24	919	2¼	39		88	P-76288
21	8- 1-24	775	½	53		27	P-76287
21	8- 7-24	763	1½	57		86	"
21	8- 7-24	764	1	82		82	"
24	8-12-24	515	3	58	1	74	A-64321
24	8-13-24	529	½	59½		30	"
21	8-13-24	733	1¼	71½		89	P-77858
24	8-13-24	505	2¾	40	1	10	A-64321
24	8-14-24	529	½	59½		30	"
24	8-14-24	524	9	49½	4	46	"
24	8-14-24	505	6¾	40	2	70	"
24	8-15-24	524	2	49½		99	"
24	8-15-24	505	9	40	3	60	"

PIECE WORK

Dept.	Date	Key No.	Hours	Pcs.	Wage Rate	Labor		Assembly or Production Order	Operation for Which There Was a Standard Labor Cost	Standard Labor Cost
21	8- 2-24	793	1	50	36		36	P-76287	Coil Winding A	70*
21	8- 2-24	793	1¾	104	36		63	"	" " B	75*
21	8- 2-24	787	1¼	44	37		46	"	" " B	75*
21	8- 4-24	793	1¼	99	36		45	"	" " A	70*
21	8- 4-24	740	6	10	35	2	10	"	Skein Winding	38½
21	8- 5-24	740	9	15	35	3	15	"	" "	38½
21	8- 5-24	806	7	5	31	2	17	"	Coil Winding C	38½
21	8- 5-24	834	5½	5	30	1	65	"	" " C	38½
21	8- 6-24	806	8¼	7	31	2	56	"	" " C	38½
21	8- 6-24	834	3½	3	30	1	05	"	" " C	38½
21	8- 7-24	806	2¼	2	31		70	"	" " C	38½
21	8- 7-24	834	2½	3	30		75	"	" " C	38½
24	8-11-24	548	¾	7	59½		45	A-64321	Assembling C	04
24	8-12-24	548	1¾	18	59½	1	04	"	" C	04
24	8-12-24	526	3	25	47½	1	43	"	" A	057½
24	8-12-24	521	4¼	8	49½	2	10	"	" D	35¼
24	8-13-24	521	9	17	49½	4	46	"	" D	35¼

* Standard cost per 100 units. The figures not starred are standard cost figures per piece.

A summary of the Weekly Payrolls is given.

PAYROLL

Week Ending—July 26, 1924

Dept.	Key	Name	Hourly		Bonus		Total	
17	575	Paul Anthony	1	95			1	95
21	723	Andrew Fowler	1	10			1	10
17	929	Frank Reid	2	07			2	07

PAYROLL

Week Ending—August 2, 1924

Dept.	Key	Name	Hourly		Bonus		Total	
21	775	Robert Martin		27				27
21	787	Raymond Morris		46				46
21	793	James Bernard		99				99
17	919	John Shirley		88				88

PAYROLL

Week Ending—August 9, 1924

Dept.	Key	Name	Hourly		Bonus		Total	
21	740	James Blake	5	25	4	38	9	63
21	763	Eugene Allen		86				86
21	764	Albert Pope		82				82
21	793	James Bernard		45		38		83
21	806	George Upham	5	43			5	43
21	834	Joseph Franklin	3	45		79	4	24

PAYROLL

Week Ending—August 16, 1924

Dept.	Key	Name	Hourly		Bonus		Total	
24	505	George Ross	7	40			7	40
24	515	Warren Burke	1	74			1	74
24	521	James Harris	6	56	2	25	8	81
24	524	John Leslie	5	45			5	45
24	526	Edward Root	1	43		01	1	44
24	529	Walter Blair		60				60
24	548	Thomas Carroll	1	49			1	49
21	733	Charles Stanley		89				89

C. OVERHEAD

The company used the following Burden Rates.

Dept. 17	.75
" 21	.80
" 24	.65

Discuss the cost accounting methods of the company.

Assumptions.

1. Assume that the Factory Ledger accounts showed the following beginning balances:

Purchased Parts	$4,820.00	
Magnet Wire	2,531.68	
Finished Parts	9,675.42	
Goods in Process—Assembly	9,252.60	
Goods in Process—Parts	6,428.62	
Department 17 Overhead	4,256.80	
" 21 "	2,975.40	
" 24 "	3,523.27	
Standard Development	2,267.32	
Shipping and Packing Costs	1,148.21	
Loss and Gain on Factory Order	1,096.80	
General Ledger		$47,976.12

2. On completion of Order No. A-64321 it was charged to the sales department at the standard rate for this type of motor.

3. The standard development cost is 2½% and the packing and shipping costs are 5% on the total factory costs.

Enter on the appropriate forms the material pertaining to order No. A-64321, viz.:

(*a*) Assembly Parts list HC-63
(*b*) Job tickets for

Date	*Dept.*	*Key No.*	*Name*
8-4-24	21	793	J. Bernard
8-1-24	21	775	R. Martin

(*c*) Make proper entries on Employee Day Record and Bonus Statement for Key. Nos. 793, 806, and 834.
(*d*) Production Orders Nos. P-76287, P-76288, C.P. 77858.
(*e*) Assembly Order No. A-64321.

Prepare the necessary journal entries to record the foregoing information on the books and post them to the Factory ledger.

6. MURDOCK SASH AND DOOR COMPANY

SUMMARIZING COSTS: WHAT METHOD MAY BE USED TO "TIE IN" THE COST LEDGER WITH THE GENERAL LEDGER?

TABLE I

SCHEDULE OF FIXED INVESTMENT

Department	Land	Brick Buildings	Wood Buildings	Machinery and Equipment	Horses and Wagons	Total for Dept.
Lumber Yard	$20,000	....	$10,000	$ 1,200	....	$ 31,200
Kilns	1,100	$ 7,500	....	4,000	....	12,600
Power House	1,800	4,500	....	17,000	....	23,300
Cutting Dept.	1,900	....	7,000	12,000	....	20,900
Molding Dept.	1,400	....	8,000	13,000	....	22,400
Door Dept.	1,100	....	6,000	11,000	....	18,100
Sash Dept.	1,200	....	8,000	10,000	....	19,200
Glazing Dept.	600	....	2,000	800	....	3,400
Warehouse	3,000	....	9,000	1,000	....	13,000
General Mfg.	1,000	....	3,000	....	....	4,000
Stables	300	....	1,000	....	$1,800	3,100
Office	1,000	....	3,000	4,000	....	8,000
	$34,400	$12,000	$57,000	$74,000	$1,800	$179,200

TABLE 2

TRIAL BALANCE, JANUARY 1

Land and Buildings	$103,400	
Machinery and Equipment	74,000	
Horses and Wagons	1,800	
Lumber Inventory	34,000	
Other Materials	12,000	
Work in Process	10,000	
Finished Work	15,000	
Supplies	4,000	
Accounts Receivable	18,000	
Cash	6,000	
Accounts Payable		$ 13,000
Mortgage Bonds		35,000
Capital Stock		200,000
Surplus		30,200
	$278,200	$278,200

TABLE 3

ACCOUNTS IN GENERAL LEDGER IN ADDITION TO THOSE IN TRIAL BALANCE

Sales
Property Taxes
Fire Insurance
Workmen's Liability Insurance
Depreciation
Reserve for Depreciation
Payroll
Salaries of Superintendence
Salaries, Commercial and Administrative
Building Repairs
Machinery Repairs and Maintenance
General Office Expense
Interest on Bonds
General Manufacturing Expense
Warehouse Expense
Profit and Loss
Liability Insurance Accrued
Interest Payable Accrued

TABLE 4

COST LEDGER BALANCES, JANUARY 1

Lumber in Process	$ 3,000
Other Direct Materials in Process	1,000
Cutting Dept. Labor in Process	600
Cutting Dept. Burden in Process	400
Molding Dept. Labor in Process	300
Molding Dept. Burden in Process	300
Door Dept. Labor in Process	900
Door Dept. Burden in Process	800
Sash Dept. Labor in Process	700
Sash Dept. Burden in Process	500
Glazing Dept. Labor in Process	600
Glazing Dept. Burden in Process	400
Power House	400
Stables	100
Kiln Costs	
Yard	
General Manufacturing	
Total	$10,000

Table 5
Cash Book Totals for January

Received: on Accounts Receivable	$68,000
Disbursed:	
Payroll	16,000
Expenses	14,200
Accounts Payable	28,000

Table 6
Analysis of Cash Disbursements for Expenses

Property Taxes	$ 600
Fire Insurance	1,000
Salaries of Superintendence	3,400
Salaries, Commercial and Administrative	4,300
Building Repairs	1,200
Machinery Repairs	1,600
General Office Expense	1,100
General Manufacturing Expense	1,000
Total	$14,200

Table 7
Purchase Record

Lumber	$19,000
Other Materials	5,000
Supplies	5,000
New Equipment	1,000
Total	$30,000

Table 8
Materials and Supplies Issued to Departments

Account	Lumber	Other Materials	Supplies
To Lumber in Process	$21,000		
To Other Direct Materials in Process	....	$7,000	
To Kiln Costs	....	......	$ 600
To Cutting Dept. Work in Process	....	......	500
To Molding Dept. Work in Process	....	......	900
To Door Dept. Work in Process	....	......	1,100
To Sash Dept. Work in Process	....	......	900
To Glazing Dept. Work in Process	....	......	800
To Power House	....	......	1,000
To Stables	....	......	700
Total	$21,000	$7,000	$6,500

Inventory of Supplies, end of period, Stables	$100
Power House	300

TABLE 9

DISTRIBUTION OF PAYROLL

Department	Indirect	Direct
Yard	$1,300	
Kilns	400	
Stables	200	
Warehouse	300	
Power House	300	
General Factory	700	
Cutting	800	$ 1,600
Molding	600	1,800
Door	700	3,200
Sash	300	2,300
Glazing	400	1,100
	$6,000	$10,000

TABLE 10

FACTORS IN BURDEN ASSEMBLY

DEPRECIATION: 5% per annum on Brick Buildings. 10% per annum on Wood Buildings, Equipment, Horses and Wagons.

TAXES: $30 per $1,000 on all Fixed Investment Assets.

FIRE INSURANCE: $20 per $1,000 on Fixed Investment Assets, except Land, which is $20,000.

LIABILITY INSURANCE: 1% of Factory Payroll.

The monthly figure of $3,400 for Superintendence is normal. Normal annual expenditure for Building Repairs is $18,000, and for Machinery Repairs, $24,000. The normal monthly distribution of these items over the departments is as follows:

Department	Superintendence	Building Repairs	Machinery Repairs
Warehouse	$ 100	$ 100	
Stables	100	50	
Power House	400	100	$ 400
Kilns	200	150	
Yard	500	200	100
General Manufacturing	900	150	
Cutting	300	200	450
Molding	200	150	350
Door	300	150	400
Sash	200	150	200
Glazing	200	100	100
	$3,400	$1,500	$2,000

Interest on Bonds is at the rate of 6% per annum, distributed through General Office Expense.

TABLE 11

POWER CONSUMPTION

Of the total Power House Expenses, it is computed that the following percentages should be charged to the departments for heat, light, and power, respectively. A charge to General Manufacturing Expense for the heat and light of the whole factory is deemed sufficient.

Department	Heat	Light	Power
Offices	3.0%	5.0%	
General Manufacturing	3.0	5.0	
Kilns	6.0		
Warehouse	......	......	3.0%
Yard	......	......	10.0
Cutting	......	......	18.0
Molding	......	......	16.0
Door	......	......	17.0
Sash	......	......	9.0
Glazing	......	......	5.0
Total	12.0%	10.0%	78.0%

TABLE 12

DISTRIBUTION OF INDIRECT DEPARTMENTS

A "vicious circle" is met with in transferring the balances of indirect departments, seeing that part of Office and Commercial Expenses are to be charged to Power House, and a part of Power House Expenses are chargeable to the Office. For practical purposes, however, the following order of closing has been found satisfactory:

1. Power House Costs distributed on power, light, and heat consumption; see Table XI.
2. Warehouse Burden is added to Office and Commercial.
3. General Manufacturing Expenses distributed as a percentage on total expense of directly productive departments.
4. Stable Expenses added to Yard Expense.
5. Office Burden distributed as percentage of yard, kiln and manufacturing department costs.
6. Yard Expenses added to Lumber Costs.
7. Kiln Expenses added to Lumber Costs.

TABLE 13

SALES BOOK—TOTAL FIGURES FOR SALES, COST OF SALES, AND PROFITS

The Sales Book shows the following total figures for Sales, Cost of Sales, and Profits:

Sales		$82,395.00
Transfers to Finished Goods:		
Lumber in Process	$22,000.00	
Other Direct Material in Process	6,000.00	
Cutting Dept. Labor in Process	1,800.00	
Cutting Dept. Burden in Process	4,905.10	
Molding Dept. Labor in Process	1,900.00	
Molding Dept. Burden in Process	4,702.20	
Door Dept. Labor in Process	3,250.00	
Door Dept. Burden in Process	5,407.00	
Sash Dept. Labor in Process	2,400.50	
Sash Dept. Burden in Process	3,741.05	
Glazing Dept. Labor in Process	1,050.00	
Glazing Dept. Burden in Process	3,010.90	
	$60,166.75	
Cost of Finished Goods Sold		61,166.00
Profit		$21,229.00

TABLE 14

ACTUAL COSTS ACCUMULATED ON THE JOB COST SHEETS

The Job Cost sheets in process were called in from the shop at the end of the month, and the actual costs accumulated on them to date were found to be as follows:

Lumber in Process	$2,000.00
Other Direct Material in Process	2,000.00
Cutting Dept. Labor in Process	400.00
Cutting Dept. Burden in Process	250.00
Molding Dept. Labor in Process	200.00
Molding Dept. Burden in Process	150.00
Door Dept. Labor in Process	850.00
Door Dept. Burden in Process	600.00
Sash Dept. Labor in Process	599.50
Sash Dept. Burden in Process	300.00
Glazing Dept. Labor in Process	650.00
Glazing Dept. Burden in Process	400.00

Prepare a sheet showing a Departmental Distribution of Burden, and show the distribution of expenses called for in the preceding tables.

Post the information given to the General Ledger and to the Cost Ledger, and take a trial balance of each.

What adjustments of the Cost Ledger are called for by the figures of Table 14? Do you think any need for revision of the accounting methods is indicated there?

B. PREPARATION OF STANDARD COSTS

1. Ritter Food Products Company

STANDARD UNIT COST: WHEN MAY A STANDARD COST PER UNIT BE ADOPTED?

The Ritter Food Products Company, situated in St. Louis, was the maker and proprietor of a line of food products including jams, jellies, preserved fruits and vegetables, salad dressing, and other relishes and condiments. Many of its products enjoyed national distribution, and the others were sold over a considerable part of the middle-western states.

Among the latter was a line of salad dressings which included eight varieties, each one put up in a number of different sizes. This line was one of the more recent additions to the list of goods handled by the company, having been acquired about three years ago, whereas the company itself had been doing business with some of its lines for upwards of thirty years. The company had not yet been able to make a financial success of the salad dressing. It had endeavored to make the product of very high grade materials, and to sell it at a price preferably higher than those of competitors. In these circumstances the volumes of sales had not yet become large enough to carry the manufacturing overhead in any economical way, let alone to absorb the large development costs involved in the advertising campaign undertaken to extend the distribution of the product. Sales varied greatly from month to month, the movement being in some degree seasonal, but there was considerable irregularity about the business. For this reason the manufacturing unit costs displayed corresponding vagaries; a line which sold at 60 cents for the pint jar, competing with lines sold by other makers at 50 cents, would in different months show manufacturing costs varying all the way from 35 cents to 75 cents a pint, according as the volume of production was high or low, respectively. The average factory cost for the year, without the additional end for the selling and administrative expense, was near the price at which the article was offered for sale.

The company was, therefore, under the necessity of determining a policy to be pursued with regard to this line and had under consideration (1) the changing to less expensive materials which would permit the company more nearly to meet its competitors upon a price basis; (2) an attempt by a still more intensive advertising campaign to develop sales to a profitable volume without change of price or product; (3) a reduction of the selling price in an attempt to enlarge the volume of business while keeping the composition of the product and the methods of manufacture the same as at present; (4) a combination of the first and third of these measures might be taken.

While these matters were still under consideration, the accounting and cost accounting system of the entire business, including all its subsidiary factories, were undergoing a thorough revision. The general purpose of this revision was to simplify the accounting procedure, to reduce the volume of clerical work devoted to the keeping of detailed and routine records, and to concentrate rather upon such facts and figures as the management might find useful. The company manufactured its products in eight different factories, and in all of these it had already been determined to adopt a system of simple primary accounts for materials, labor, and burden costs, and to compute unit costs on the different lines for the purpose of transferring goods finished during the period from the Work-in-Process account to the Finished Goods account. On most of the lines the selling prices were seldom changed, and cost figures could, therefore, contribute nothing to questions of price determination. Their main functions were to serve as a control of manufacturing expenses and as a measure of efficient performance by the plant. The operations of each factory were recorded in a separate Factory Ledger, each controlled from the General Ledger. A new list of accounts was drawn up for each ledger, the accounts being coded numerically, the same account in different ledgers being given the same code number. Practically all the other lines of the business were profitable, and the foregoing accounting plans were judged to be suitable for them under these conditions.

The question arose, however, as to the advisability of applying this new accounting set-up in its entirety to the salad dressing factory. If a standard unit cost were adopted, upon what basis as to output should it be computed? Should it be assumed that the average output of past years should be used as the volume; or should a profitable volume of business be assumed and the standard cost computed upon that basis; or should an attempt be made to determine a point which would be an advance over past experience, though not yet a profitable volume of business? In discussing this question, it was pointed out that there would be little to be gained by continuing the cost accounting by the old methods, and based upon the old volume of production, first, because the company was exceedingly anxious to get away from those conditions, and, second, because actual costs had been kept and reported monthly throughout the three years of the company's experience with this line. From these the company could readily use the unit costs at almost any rate of output, in which it might be interested. On the other hand, it would not be considered advisable to assume a volume of output which would give profitable business, as that would represent a position too far removed from the present facts to be of any material benefit. A further proposal was to abolish all computations of cost figures and to go on to an inventory basis of accounting, finding the value of the inventory in process at the end of each month, and treating the balances of the cost of manufacture, but without determining unit costs. In support of this it was again pointed out that unit costs had already been gathered under a great variety of conditions, and that the general management seemed to have little confidence in any of these, due chiefly to the wide fluctuations which were found in them.

After due discussion of all these aspects of the problem, the company decided to continue gathering actual unit costs rather than to adopt standard unit costs, which must in any case rest upon very arbitrary assumptions. It was intended to make a definite decision of policy with regard to this, determined within the next two or three months, and since this decision might even run to the complete abolition of this branch of the business, it was not regarded as profitable to go to the amount of trouble necessary to compute the standard figures or to turn this part of the accounting procedure into confusion for the sake of a possible short period of operation. It was, however, decided to apply to the salad dressing factory a code of accounts similar to those being adopted in the other plants. This would enable the same code numbers to be used throughout the entire organization and would avoid the confusion which might arise from using a different code in this department from that used in all other departments. If it were, this would be a further advantage if the decision should be to continue this branch and especially would it facilitate the transition to a standard cost system similar to that used in other departments if that should be desired.

Do you think the Ritter Food Products Company was sound in its decision to continue to use only actual costs?

2. Baka Biscuit Company

COST VARIATIONS: OF WHAT VALUE ARE STANDARD COSTS WHICH GIVE TOTAL, QUANTITY, AND PRICE VARIATIONS?

The Baka Biscuit Company was organized in 1903 to manufacture a cereal biscuit under a process patent which it had obtained. A favorable reception of the product by the public had assured the company of success from its inception, and its growth had been steady and continuous, the productive capacity of the plant having been doubled in the first 25 years of its existence. At full capacity the factory employed about 700 people, many of whom were girls. A considerable number of the manufacturing operations were performed by automatic machines, which had been specially developed by the company. The machines were arranged in groups, each group operating as a complete production unit, as many units being operated as would produce the quantity of biscuits needed to satisfy the consumer's demand.

The process of producing a biscuit was divided into four primary operations: (1) cleaning and sorting the grain used, (2) steam cooking and drying, (3) grain grinding, biscuit molding, and baking, and (4) packaging, sealing, and packing for shipment. There were three process inventory points as the grain flowed through the plant, one between each two of the above-named operations. At each of these points the material in process was easily measured or counted, which enabled the company to keep accurate daily records of the material that passed from one operation to the next. Because the process inventory was so easily available at these points, the cost accounting system was designed to show the accumulated cost of the process at each of them.

1. Old Cost Procedure

The cost procedure used by the company had been comparatively simple, and based upon the process method of cost accumulation. Since the company produced only a single product which had to bear all of the costs, the management had always been of the opinion that an elaborate system of accounting was unwarranted.

A. Material

Direct materials, grain being the most important, were furnished to the plant in sufficient quantities to supply adequately the units operating. The amounts of grain requisitioned to process, as well as the amounts passing from operation to operation, were determined from the foremen's daily reports. The packages and cartons required were checked in the same way, while the monthly totals of all production quantities were obtained from summary operation sheets compiled from the foremen's daily reports. The materials were charged into process at the average cost of the inventory on hand and charged from each operation to the next at the average cost of the beginning inventory at that center and the production for a month.

Indirect materials required by the factory were obtained from the storeroom by requisitions signed by the foreman, who noted, in addition to the supplies wanted, the account number to which the materials were to be charged. These requisitions were forwarded from the storeroom to the cost department, where they were priced and extended and the quantities entered on the Balance-of-Stores cards. At the end of each month the requisitions were then sorted according to account numbers, and the total cost of the indirect materials requisitioned was ascertained for each account number, which gave, for the period, the indirect material charges for special work orders and the different departments. When special items were purchased outside, they were, when received, sent directly to the requisitioner and the account to which it was to be charged was debited at once from the Voucher Register.

B. LABOR

In the case of labor the principal source from which the company determined the labor charges for the various departments was the weekly Clock cards upon which the time clock stamped the time each person entered and left the plant. These cards were collected for a week in each department and sent to the payroll office, where a clerk totaled the number of hours worked as shown on each card and multiplied the total by the employee's hourly rate to get his weekly earning. These calculations were checked, and the Payroll Sheet was made up, showing, in addition to the earnings for each employee, the total direct and indirect labor charge in each department. The totals were then taken by the cost office and distributed to the various departments.

Employees were constantly transferred for short intervals from one department to another, and adjustments had to be made in the amounts obtained from the Payroll sheets in order to obtain the correct departmental labor charge for the period. The various departmental foremen made out Transfer slips whenever one of their employees worked in another division of the shop; this slip gave the department to which the employee was sent and the time he remained there. The labor charge was figured for each transfer and summarized at the end of the month, at which time adjustments were made in the payroll totals to get the corrected labor costs for the period. Because a month seldom ended on the same day as the payroll week, it was usually necessary for the cost department to analyze also the Clock cards for the last few days of the period, in order to complete the labor charges.

In the service departments the employees were required to keep, in addition to the regular Clock Card, a second record of their time. They were engaged either in regular work, or in special work for which the cost department had issued order numbers to which all charges were to be made. Each employee had to fill in a report showing the amount of time spent on each job and the order number to which it was to be charged. The reports were sent to the cost office, where the labor charges for the time spent on the different jobs were summarized. The total number of hours worked per week by each employee as shown on these reports was checked against the hours shown by their Time Clock Card.

C. Burden

The expenses of the nonproductive departments were distributed directly to the productive departments wherever such allocation was possible; for instance, expenses involved in doing work on standing or special orders for particular departments of the factory were charged directly to those departments. The costs of operating some of the other service departments were distributed on a basis best suited to the situation; the expenses of the power plant, for example, were allocated according to the amount of steam and power used by each department. Those expenses which could not be directly charged to the various producing departments were charged to the General Factory Burden account, which was distributed to the producing department on a direct-labor cost basis.

The controller was aware that this method of allocating general burden was not as accurate a method as might be devised but believed it to be adequate for his purposes. Since the company produced only the one product, there was little to be gained by a complicated method of burden distribution. Formerly, the General Burden account had been distributed on three different bases, but a trial on the labor cost basis showed that approximately the same results were obtained which had led the company to the conclusion that the three methods were not warranted. Furthermore, the total direct labor cost was about equal to the amount of burden to be distributed, so that it was large enough to be a satisfactory base for the distribution of burden.

D. DEPARTMENTAL COST SHEETS AND INVENTORY ACCOUNTS

After the expenses were distributed, Departmental Cost Sheets were made up which were summary statements of all costs incurred for the period. The totals of the figures shown on these sheets were carried to the Departmental Inventory accounts which contained the beginning inventory plus the departmental production cost; there were two credits in the Inventory accounts, one showing the cost of the goods transferred to the next department and the other the final inventory. A sample of the Cost Sheet and one of the Inventory account are given.

DEPARTMENTAL COST SHEET

Cleaning Department	October, 1922
Grain	$45,000
Direct Labor	3,055
Indirect Labor	600
Supplies	350
Cost Orders Completed	1,120
General Burden	2,775
Total Cost	$52,900

DEPARTMENTAL INVENTORY ACCOUNT

Cleaning Department	OCTOBER, 1922	
	Bushels	Amount
Debits:		
Beginning Inventory	1,500	$ 2,100
Production for Month	42,500	52,900
	44,000	$55,000
Credits:		
Ending Inventory	1,200	$ 1,500
Forward to Cooking Dept.	42,800	53,500
	44,000	$55,000

By using this system of preparing cost sheets, all items of expense were added together and carried to the Inventory accounts as the cost of the grain processed, the total figure including material labor, and burden costs. On the Inventory Sheet the value of the product sent to the next department was ascertained by using the average of the beginning inventory value and the production cost for the period. This average price, multiplied by the quantity of bushels transferred to the next department, gave the dollar amount of the charge to that department. The cost was thus cumulative; the quantity and cost of the material charged out of one department had to be determined before the Cost Sheet for the succeeding department could be prepared; the cost arrived at in the last department represented the cost of biscuits finished during the period; it was credited to the last department and debited to Finished Goods. The three Departmental Inventory accounts, an account controlling the Balance-of-Stores cards for direct materials entering into the product, and another for indirect materials, were kept in the Factory Ledger. These five accounts were controlled by an account in the General Ledger entitled "Product Materials."

II. Alteration of Cost Procedure

In 1922 the company employed a new executive to be known as "vice-president in charge of finance." At the usual intervals the regular reports made up as shown on the above Cost Sheet were sent to the new executive. He stated that the reports were inadequate and requested the controller to prepare a report which would show the Inventory in Process accounts in detail rather than in single total. He also wanted the reports to show costs of operations in the factory on a material, labor, and burden basis, so that as the work progressed through the plant the report would show the increase in each of the elements of costs rather than one cumulative total.

Since the accounts had not been kept to supply the information requested, the controller had to analyze in detail all of the cost sheets, carrying forward separately the material, labor, and burden charges from one department to the next. Where there was an inventory in process, the percentage of the three elements of cost in the inventory also had to be determined. This analysis required considerable work and, as it had to be done month after month, the controller decided to revise the cost system so that the type of information wanted could be obtained directly from the regular records.

A. Parts of Old System Changed

The changes which the controller decided to make in the cost system were confined entirely to the way in which the Departmental Cost sheets and Inventory Cost sheets for the period were prepared. Under the revised system the Departmental Cost sheets were to be devised so that they would incorporate the statistical information the new vice-president desired and the Departmental Inventory sheets were to be divided into three sections, one each for Material, Labor, and Burden. In addition, the method of costing the inventory was changed. The price of the oldest lot on hand was to be used instead of an average price, since the latter had the disadvantage of incorporating price variations caused by abnormal conditions, thus perpetuating them in the charges to be made for goods put into process.

B. Adoption of Standard Costs

The controller was of the opinion that the adoption of standard costs would be advantageous because total, quantity, and price variations could be ascertained, such costs to be used for statistical and managerial purposes only. The standards set for the processes were to be developed from the operation records of the more efficient units in the shop for the preceding year and were to be revised from time to time as better statistics became available. In the development of the new system, the standard costs and total variances were to be carried out accurately to the nearest cent, but the quantity and price variation were to be worked out to the nearest dollar as they were to be used for statistical purposes only. When standards exceeded actuals, the amounts were to be entered in black, and when actuals exceeded standards, the variation was to be entered in red.

C. Departmental Inventory Account

The Inventory Sheet (Form 1) under the new method was designed so that it could be used for all departments and for the three elements of cost.

DEPARTMENTAL INVENTORY SHEET

October, 1928

	Per Cent	Actual Quantity	Labor Variances			
			Standard	Total	Quantity	Price
			E	TV	QV	PV
Cooking and Curing			$0.019673			
Production		41,963	825.54	9.24	14.	5. *
Opening Inventory		2.200	43.28	1.02*	1.	2. *
Closing Inventory	3.16231	1.327	26.11	.29		
Amount Used		42,836	842.71	7.93	15.	7. *
Grinding and Baking						
Production						
Opening Inventory						
Closing Inventory						

* Figures in red. Baka Biscuit Co.

Form 1.

To reduce the clerical work, actual amounts were not entered on this sheet, the accounting procedure being carried through with standard costs and total variations, from which at any time the actual costs could be determined. The beginning inventory was ascertained from the Inventory account for the preceding period, and the quantities of material handled by each department, measured in bushels, were obtained from the monthly summary of the foremen's daily reports. The accumulated standard rate to the end of a particular department was given as the first figure in column "E." This rate times the quantities carried in the second column gave the standard labor cost for processing those quantities. In the "Total" column was given the variation which was found by comparing the actual costs for each department for each of the items listed with the standard cost as given in column "E." In the "Per Cent" column the closing inventory was expressed as a percentage which was computed by dividing the final inventory quantity by the volume of production, both of which were given in the second column. The closing inventory variance was obtained by multiplying the percentage of closing inventory given in the first column by the total variation for production given in the first figure in "Total Variance" column. The "Quantity" and "Price" columns contained the analysis and detail of the total standard variation figures. As pointed out, these last two columns were carried only to the nearest dollar. At the right of the "labor variance" section, the "material" and "burden variance" sections were given; they were handled in much the same manner as the "labor" section. To economize space, these sections are omitted in the form given above.

D. Departmental Cost Sheet

In the development of the cost of production in the different departments, separate sheets were to be made up for labor, material, and burden. A copy of the Labor Cost Sheet (Form 2) is given.

The standards which had been set for the different operations were entered in the first three columns of this sheet. The actual totals of the operations expressed in the proper units of measurement were given in the fourth column. The next three columns were used for the calculation and recording of costs, while the last three columns contained the variations between actuals and standards on the various operations.

The Labor Cost Sheet given on the next page is for the department following the one considered in the Departmental Inventory Sheet shown on the preceding page. Consequently, the "Amount Used" as shown on the inventory sheet was brought forward and entered on the Labor Cost Sheet on the first line in column "D." Past experience in the grinding and baking department indicated that 8.3 bushels of grain would make 1,000 biscuits; this was taken as the standard in that department, as shown in column "A." Because of changes in the quality and class of grain used, this ratio varied, so that more or less than 8.3 bushels of grain had to be used to produce the standard 1,000 biscuits.

LABOR COST SHEET—OCTOBER, 1928

Grinding and Baking	A	B	C	D	E
	Standard	Standard	Standard	Actual Units	Standard Cost
	Amount per Unit of Production	Operation Rate per Unit Amount	Cost per Unit of Production A×B	Measured Quantity or Amount	"C" Times Production
Labor Forward Actual.....				42,836 bu.	
Labor Forward Standard..	8.3 bu.	.019673	.163	42,836 bu.	830.79
Grinding Labor...........	.374 hr.	1.914	.716	1,872.50 hr.	3,649.35
Baking Labor............	.251 hr.	1.322	.332	1,307.25 hr.	1,692.16
Biscuit Production........	1,000 biscuits		1.211	5,096,860 (1,000 biscuits)	6,172.30

Grinding and Baking	F	G	TV	QV	PV
	Account Units at Standard Rate	Actual Cost	Total Variance	Quantity Variance	Price Variance
	B×D	Dollars	E−G	E−F	F−G
Labor Forward Actual.....		834.78	7.93	15.00	7.00*
Labor Forward Standard..	842.71		11.92*	12.00*	
Grinding Labor...........	3,583.97	3,674.92	25.57*	65.00	91.00*
Baking Labor............	1,728.18	1,663.47	28.69	36.00*	66.00
Biscuit Production........		6,173.17	0.87*	32.00	32.00*

* Figures in red. Baka Biscuit Co.

FORM 2.

The total variation was equal to the difference between the standard labor charge for the material entering the department and the standard labor charge up to the same point on the actual production in the department. Thus, on the second line, the standard labor cost for the amount of grain used which should have produced 5,160,964 biscuits, was given as $842.71 as taken from the Inventory Sheet, while the standard labor cost for the actual number of biscuits actually produced which was 5,096,860 was $830.79. The difference in the quantities represented the amount of loss in units and dollars due to changes in the quantity of material contained in each biscuit, because of processing conditions; this difference was an additional quantity variation.

The labor costs of the two operations performed in the grinding and baking department were developed on the third and fourth lines. The amounts given in columns "D" and "G" on these lines were determined from the actual records for the period, which, when used in conjunction with the standard rates and the amount of production, were sufficient to complete the sheet. The letters in the columnar headings indicate how the figures in the columns were determined. The information to be carried forward to the Inventory Sheet of the next department was obtained from the last line on which the costs for the department were summarized. This procedure was followed in the case of material and burden and for each department throughout the process; as under the old system, the cost of the product finished in the last department gave the debit to the Finished Goods account.

Usually the quantity and price variations were worked out at a later date, as they were used only for statistical purposes and did not need to be developed immediately in order to complete the cost records. Under the new system, an Inventory in Process account for each of the three elements of cost was kept in the Factory Ledger.

These accounts, as was intended, contained only actual costs of the materials; the supporting statements and Departmental Inventory sheets, as already indicated, carried only standard costs and variations.

What advantages, if any, do you feel the company received from the new system?

Wherein would the different variation figures give the management any information that it did not have under the old system?

In general, would you say that operating the accounts to show variations was worth the cost and effort required?

3. Birch Engineering Equipment Corporation—No. 1

CONTROL PROCEDURE: SHOULD TWO DIVISIONS OF A BUSINESS BE CONTROLLED IN THE SAME WAY?

There were two principal divisions to the activities of the Birch Engineering Equipment Corporation; the main part of the business was restricted to the production of large units of auxiliary apparatus for steam power plants, whereas the other division was engaged in the production of brass tubes for piping, condensers, and similar equipment.

Conditions had become unsatisfactory in the tubing division, and consulting engineers were called in to make a complete survey of its activities and to outline steps necessary to put it on a profitable basis.

Upon the completion of their study, the consultants submitted a report to the company covering their activities and findings. Foremost among their criticisms was a complete disapproval of the control methods used in the factory. The tube division had been developed along the same lines as the equipment business but the two were fundamentally different, in that engineering apparatus was made on an order basis to meet the specifications of individual customers, whereas the manufacture of tubing was essentially a matter of mass production. In trying to operate the tube department on an order basis, therefore, the company had not been able to secure the lowest production costs possible, and thus found itself at a disadvantage in the highly competitive market which it served.

Under the present system, orders taken by the sales department were sent from the head office to the factory, where a production clerk made up the necessary forms which he forwarded to the tube mill superintendent, inspector, shipper, and others. Upon receipt of his copy of the order, which was the first notice he had had of current sales requirements, the superintendent went to the regular storage space for finished tubes to see if the order could be filled from stock. If this was impossible, he assigned the job to a "bench" (a productive center where the tubes were drawn) and promised delivery on the order according to the average time required to make that size of tube.

The next responsibility of the superintendent was to ascertain if there was sufficient raw stock on hand from which the tubes could be made and, if not, to requisition the brass casting shop superintendent for a supply of the necessary castings. Because of the limited number of casting sizes used, the brass casting shop superintendent usually had an adequate supply on hand to meet immediate needs; this verbal request of the tube mill superintendent was the first notice he had of current requirements. If castings were not on hand and the virgin metal used to make them was out of stock, a material requisition was sent to the purchasing agent. This situation seldom occurred, for the brass casting shop superintendent, personally, took a physical inventory of stock daily and was careful to see that adequate raw material was on hand; nevertheless, the purchasing agent was never informed in any other way of the stock needed by the factory.

Progress on each order was personally checked by the tube mill superintendent by means of Unfilled Order lists which were furnished him regularly. The production order clerk also checked the progress of the orders through report slips turned in by the inspectors, shippers, and reports furnished by the superintendent.

A minimum of stock control was exercised in the factory. Stocks of pipe sizes were kept on hand but no record made of them; the tube mill superintendent made visual estimates of the quantities in the racks. Approximately a month's supply of partially drawn tubes was supposed to be kept on hand as an aid in filling orders within a reasonable time; when an order was received, it only became necessary to finish drawing the material to the correct size and gauge. The raw material supply was checked by the brass casting shop superintendent daily, and a week's supply kept in stock. The accounting department also kept a record of the raw material used in order to develop a weighted average price per pound, which was used in the cost work.

On the basis of their study, the consultants outlined a number of definite criticisms to the current procedure, before giving their recommendations:

1. The tube mill superintendent did not have an opportunity to plan his work in advance, and, as a result, could not schedule it in the most advantageous manner.

2. As most of the orders were for small lots, considerable time was lost in changing dies and shifting men. Continuous work on one size was not provided; consequently, the workers acquired a satisfactory productive speed on a lot about the time the job was finished.

3. Continued shifting and changing of laborers made the payment of a bonus which was adequate to insure a high rate of production, a difficult matter.

4. The lack of stock control did not permit the plant to be operated on mass production based on maximum and minimum points which could be established from estimated sales requirements. Because of the lack of records, there was no check on the turnover obtained on the different sizes of tubing, which undoubtedly led to the carrying of insufficient stocks of some sizes and unnecessarily large stocks of others.

5. The use of stock records would aid the production department in setting accurate delivery dates and in making immediate delivery; moreover, this would be of distinct advantage as the trade was willing to pay a slightly higher price for quick shipments. Stock records based on estimated sales requirements would allow the carrying of stock at intermediate production stages from which it could be quickly finished and delivered.

6. Information obtained from stock records would aid the superintendent in scheduling production, so that different gauges and lengths of tubing could be made with a minimum of scrap and waste.

7. The superintendent devoted too much of his time to clerical details. His job, fundamentally, was to direct production, supervise his men, and confer with the engineers and works manager on the means of increasing output and reducing costs. He was employed for his technical knowledge and should not be loaded down with routine work.

8. Existing methods did not allow the purchasing agent to carry on his work to the best advantage. He was notified when material was required but had no advance information as to what would be needed. It was suggested that a record of estimated sales translated into raw material requirements would be advantageous to the buyer in watching the market and bargaining on a price basis for the stock needed.

After outlining their criticisms of the existing procedure, the consultants constructed a system, which, in their opinion, would meet the needs of the company; the basis of this system was the organization of the manufacturing schedule on a mass production program. Under existing competitive conditions they pointed out that it was necessary to use the most economical means of operation in order to make a satisfactory showing. The budget or manufacture-for-stock plan which they advocated for the tubing division was as follows:

1. The sales department would make up a schedule of estimated sales, giving kind, length, and gauge, for a month in advance.

2. A stock record was to be kept for each variety of product,

giving balance on hand, quantity inspected, quantity on order, and sales requirements.

3. From the comparison of sales requirements with stock on hand weekly production schedules would be made up, both for the tube mill and the casting shop, to meet the estimated demand. The weekly period would allow flexibility in revising the total production and in scheduling. Hand-to-mouth buying which had developed in the trade made accurate forecasts difficult and uncertain, and thus the estimated sales requirements would be subject to revision if they proved to be out of line with actual orders received.

4. Through the detailed study of the processes and equipment there would be set up standard specifications for making all kinds of tubes, which would cover the "benches" to be used, the number of men required, the economical lot size, and the technical details of the processes.

5. The production schedules would be used as the basis for the manufacturing orders which authorized the work. They would also serve as the medium for routing the work through the shop in the most advantageous manner, as determined by the standardized processes.

6. The weekly schedule would be forwarded to the superintendent and would be accompanied by the manufacturing orders for the work laid out. The manufacturing orders would be sent to the foremen a day in advance of their scheduled production, which would enable them to keep the men busy without personal supervision by the superintendent.

7. Completed Manufacturing orders would be returned to the superintendent each day, indicating the finished production. This would allow the superintendent to adjust the schedules set up on the basis of standards, which would not always correspond to the actual performance, and to rate the crews as to their productive efficiency.

8. The schedule clerk would check the manufacturing orders daily, and, where necessary, would revise the production schedules in advance to conform with new sales requirements or unforeseen conditions in the shop.

9. The production schedule would be broken down into raw material requirements and forwarded to the purchasing agent for his guidance. He would then check these requirements against the Raw Material records and determine what it was necessary to purchase during the coming months and place his orders for stock to the best advantage.

The system was designed to relieve the superintendent of the clerical routine which he had been forced to assume and, at the same time, provide him with the information which he should have. Furthermore, it fostered intelligent planning and the operation of the factory at maximum efficiency.

Did the consultants correctly analyze the situation in the tube division?

Should all the recommendations be adopted?

What general basis for costing should be used if the new system were put into effect?

Would manufacturing orders be the same thing under the new system as under the old?

4. H. L. WAYLAND COMPANY

STANDARD COSTS: WHAT INFORMATION MAY BE DEVELOPED BY THE USE OF STANDARD COSTS IN A WOOLEN MILL?

The H. L. Wayland Company was situated in a Pennsylvania city and made woolen cloths and felts of a high quality. In spite of this quality, however, the company encountered considerable price competition which it was compelled to meet by adjusting its own selling prices to market conditions. The company officials believed that under these circumstances it was necessary to watch manufacturing costs very carefully with a view to keeping them down to a point at which they would be able to show a profit on the prices they were able to realize. With this in mind they operated a system of standard costs which was designed not only to make comparisons between standard and actual costs, but also to analyze the differences and trace them to their causes. The company had been led to adopt this system in the expectation that it would assist them in making profits:

1. By disclosing preventable wastes in such a way as to lead to their elimination.
2. By making the collection and analysis of costs with a minimum of clerical expense.
3. By furnishing precise information to the manufacturing executives as a basis for their future policies.

The net results of the standard cost system were summarized monthly in Form 1, giving the actual amounts of the manufacturing expenses, the comparison of these with the standard amounts, and an analysis of the factors causing the variation. This form was submitted to the principal executives, who were thereby enabled to get a bird's-eye view of the operations of the company for the preceding month.

STATEMENT OF COST VARIATIONS

Month of 192

	This Month	Last Month	Year to Date
Labor	56,941.21		
Salaries	14,074.16		
Vacation Wages	1,170.84		
Reserve for Accidents	2,927.10		
Supplies	14,315.64		
Repairs	6,087.42		
Damaged Goods	1,105.89		
General Mfg.	118.23		
Depreciation	8,346.90		
Insurance	267.37		
Taxes	2,906.10		
Total Actual Expenses	107,861.86		
Total Stand. Expenses	98,634.13		
Net Increase or Decrease	9,626.73*		
Due to:			
Productive Efficiency	3,214.42*		
Idle Time	4,772.21*		
Labor Time	1,216.03*		
Labor Rates	98.70*		
Material Quantity	1,743.86*		
Material Prices	91.10		
Supplies Used	101.13		
Repairs Made	963.20		
Miscel. Causes	1,236.94*		
Excess Wool Waste	1,500.00		
Pound of Wool Mixed	181,785		
Pounds of Wool Woven	146,540		
Pounds of Wool Finished	134,981		

* Loss.

H. L. Wayland Co.

FORM 1.

The total figures in Form 1 rested upon figures accumulated by the different departments on Form 3. This form gathered the items of expense incurred by the department for a four-week period and analyzed the cost variations on each item of expense into the ten causes of loss or gain which might arise, as shown in the last ten columns of the statement. These Departmental Cost sheets in turn were summarized on Form 2, the totals of which furnished the figures for Form 1.

As a basis for obtaining the departmental charges, the items of expense, with the standard amount for each, were listed on

SUMMARY OF COST SHEETS—FEBRUARY 27, 1926

Department	Actual Expenses for Period	Standard Expenses for Month's Production	Net Increase or Decrease	Due to Productive Efficiency	Due to Idle Time	Due to Labor Time	Due to Labor Rates	Due to Material Quantities	Due to Material Prices	Due to Supplies Used	Due to Repairs Made	Due to Miscel-laneous Causes
Sorting												
Scouring												
Preparing												
Tanning												
Dyeing												
Carding	7,718.36	6,349.67	1,368.69	739.81	85.83	98.89	.69			26.68	387.02	85.01
Spinning												
Ring Spinning	1,280.09	1,111.09	169.00	57.52	39.54	54.98	6.31			2.28	61.81	87.36
Cop Winding												
Warping												
Weaving												
Cloth Weaving												
Burling												
Joining												
Fulling												
Washing												
Felt Drying												
Cloth Drying												
Blanket Drying												
Jackets												
Gigging												
O. D. C.												
Blanket Shipping												
Cloth Press and Finishing												
Packing												
Waste												
Cloth Burling												
Drawing-In												
Filtration												
Steam Plant	5,146.94	3,748.10	1,398.84	292.03	22.53	83.56	117.47	1222.47	2.19	29.30	327.25	15.14
Power												
Building												
General												
Total	109,861.86	98,634.13	11,126.73	3,214.42	4,772.21	1,216.03	98.70	1,743.86	91.10	101.13	963.20	1,236.94

H. L. Wayland Co.

FORM 2.

COST AND

RING SPINNING AND TWISTING DEPARTMENT

Department Hours { Productive Units . . . Ratios	44,160

Acct. No.	Account	Standard Costs					Actual Hours Worked or Quantity Used	Standard Rate or Price	Actual at Standard
		For Standard Week		For Month's Production	For Hours Actually Worked	For Hours Possible in Period			
		Number or Quantity	Amount C	H	E	D			B
	Girls . . . . (pc)	4		171.06					
	Flyer Frames . . . . (pc)	2		195.72					
	Fixer . . . . (d)	1	33.00	95.50	104.44		173	.6875	118.93
	Spool Boys . . . . (d)	2	40.00	115.76	126.60		370¼	.4167	154.28
	Sorter . . . . (d)	1	40.00	115.76	126.60		192	.8333	159.99
	Bobbin Boys . . . . (d)	2	32.00	92.61	101.27		192	.3333	63.99
	Overseer and Foremen . . . . . . (e)	2	22.93	66.36	72.57	91.72			
	Tester . . . . (d)	1	20.00	57.88	63.30		192	.4167	80.00
	Vacation Pay, 2% . . . . (p)		5.62	16.26					
	Res. for Accidents, 5% . . . . . . (p)		14.05	40.66					
	Total Payroll		(207.60)	(967.57)					
	Supplies . . . . (p)		1.14	3.30					
	Repairs . . . . (p)		24.03	69.54					
	Depreciation Machy . . . . (e)		10.78	31.20	34.12	43.12			
	Ring Frames Machy. Eqpt . . . (e)		1.70	4.92	5.38	6.80			
	Slubbers and Mach . . . . (e)		11.45	33.14	36.24	45.80			
	Insurance . . . . (e)		.49	1.42	1.55	1.96			
	Total Without Items . . . . . . (f)		(257.19)	(1111.09)					
	Steam . . . . (f)		1.59	4.60	5.03				
	Power . . . . (f)		7.85	22.72	24.84				
	Buildings . . . . (f)		18.44	53.36	58.36				
	General . . . . (f)		51.34	148.58	162.48				
	Total		336.41	1340.35					
						Less Idle Time Expense			

H. L. Wayland Co.

* The figures are not actual, but are for illustration only.

FORM 3.

Form 4. The items in this particular form represent the building charges for purposes of general burden accumulation; similar forms were prepared also, to be incorporated in burden, for other service departments and for general factory burden. Still other sheets, with the same arrangement as Form 4, were prepared to show the standard expense items and amounts for each of the direct operating departments. In the standard ex-

VARIATION SHEET *

4 Weeks Ending

127,796.8 2.894	139,760 3.1649	176,640 4.0

Analysis of Cost Variations

Actual Expenses	Net Increase or Decrease	Fixed Charges		Labor		Material		Supplies Used	Repairs Made	Distributive Charges	Miscellaneous
		Productive Efficiency	Idle Time	Time	Rates of Pay	Quantity Used	Prices				
A	H-A	H-E	E-D	E-B	B-A	B	B-A	H-A	H-A	H-A	
305.54	134.48										134.48
128.74	66.98†										66.98†
118.80	23.30	8.94		14.49	13†						
148.08	32.32	10.84		27.68	6.20†						
160.00	44.24	10.84		33.39	.01						
64.00	28.61†	8.66		37.28†	.01						
91.72	25.36	6.21	19.15								
80.00	22.12	5.42		16.70							
21.94	5.68										5.68
54.84	14.18										14.18
(1173.66)	(206.09)										
1.02	2.28†							2.28†			
7.73	61.81†								61.81†		
43.12	11.92	2.92	9.00								
6.80	1.88	.46	1.42								
45.80	12.66	3.10	9.56								
1.96	.54	.13	.41								
(1280.09)	(169.00)	57.52	39.54	54.98	6.31†			2.28†	61.81†		87.36
6.34	1.74										
31.48	8.76										
67.70	14.34										
212.19	63.61										
1597.80	257.45	57.52	39.54	54.98	6.31†			2.28†	61.81†		87.36
39.54											
1558.26											

H. L. Wayland Co.

† These figures are gains (decrease) compared with standards; other figures are losses (increase).

FORM 3. (*Continued*)

pense schedules dealing with burden items the unit on which it was proposed to distribute the expenses there listed was indicated at the top; also the nature of each item was shown by a letter which classified it according to an account classification inserted at the top of the schedule. This, it was expected, would be of value when the causes of variations came to be stated.

The burden expenses gathered on the standard expense sched-

STANDARD EXPENSE SCHEDULE

Company Department Plant

Standard Unit Standard Units in Standard Week

Number	Account Name	A/C Class	Number of Persons	Hours in Standard Week	Standard Rate		Standard Cost	
					Amount	Per	Per Standard Week	Per Production Unit
	Day Watchman	(*e*)	1		20.00	Week	20.00	
	Night Watchmen	(*e*)	2		28.00	Week	56.00	
	Grounds Keeper	(*e*)	1		25.00	Week	25.00	
	Janitors and Cleaners	(*d*)	13		24.00	Week	312.00	
	Elevator Men	(*e*)	2		20.00	Week	40.00	
	Milk Man	(*e*)	1		25.00	Week	25.00	(430.00)
	Total Payroll						(478.00)	
	Vacation Wages 2%	(*e*)					9.56	
	Reserve for Accidents 5%	(*e*)					24.00	
	Building Supplies	(*d*)					17.58	
	Lighting Supplies	(*d*)					15.21	
	Purchase Power for Lighting	(*d*)					79.02	
	Building Repairs	(*d*)					309.00	
	Lighting Repairs	(*d*)					66.70	
	Depreciation:							
	Buildings $631,593.29	(*e*)					243.00	
	Structural Equip. $141,974.15	(*e*)					158.10	
	Machinery (Bldg.) $1,860.32	(*e*)					3.57	
	Lighting Lines and Equipment $24,880.61	(*e*)					14.78	
	Machinery Equip. (Bldg.) $158.29	(*e*)					.41	
	Property Taxes	(*e*)					665.00	
	Fire Insurance (Building and Lighting)	(*e*)					10.00	
	Total						2093.93	

H. L. Wayland Co.

ACCOUNT CLASSIFICATION

(*b*) Fixed Charge per Month.
(*d*) Fixed Charge per Hour Worked.
(*e*) Fixed Charge per Week.
(*f*) Distributive Charge.
(*p*) Charge Varying with Prod.

FORM 4.

ules were then distributed to departments; separate schedules were prepared for the distribution of building expense, steam plant, and general factory expense, all on the customary bases; these separate schedules were then summarized in Form 5, which showed all the charges to be made to the different departments for burden expense.

To cover the cost of a particular style or quality of product Form 6 was prepared. On this it was planned that the designing department would enter all the technical factors connected with the description of the cloth and its manufacture; the cost department would then fill in the standard cost figures as shown in the form, resulting in a total standard cost per pound or per

STANDARD DISTRIBUTION OF GENERAL EXPENSES

	Filtration		Steam Plant		Power		Buildings		General Factory	
	Per Cent	Amount	Per Cent	Amount	Per Cent	Amount	Per Cent	Amount	Per Cent	Amount
Sorting			.17	1.82	.15	1.44	1.74	36.45	1.34	61.55
Scouring	13.55	56.91	16.71	173.28	5.48	51.08	2.32	48.61	.85	38.96
Preparing	.17	.71	1.37	14.25	5.90	54.85	4.51	94.48	2.17	98.91
Tanning	1.64	6.89	.02	.17	.02	.13	.16	3.35	.21	9.59
Dyeing	10.80	45.38	14.50	151.56	3.00	27.95	1.51	31.64	1.72	77.92
Carding	.30	1.27	2.47	25.77	17.35	161.56	10.83	226.88	7.50	342.71
Spinning	.28	1.17	2.28	23.75	8.49	79.18	13.26	277.79	6.05	276.52
Ring Spinning			.15	1.59	.83	7.85	.88	18.44	1.12	51.34
Cop Winding	.06	.26	.51	5.27	2.57	23.93	3.10	64.94	3.90	178.14
Warping	.09	.37	.71	7.45	4.34	40.47	3.74	78.35	1.96	89.58
Drawing-in			.07	.74	.06	.58	.71	14.87	1.28	58.31
Weaving	.34	1.41	2.66	27.64	11.25	106.38	18.25	382.32	17.87	816.50
Cloth Weaving	.07	.31	.61	6.31	2.12	19.71	4.58	95.95	5.14	234.73
Burling	.03	.11	.22	2.32	.22	2.06	2.19	45.88	6.55	299.26
Cloth Burling									1.42	64.82
Joining	.04	.18	.35	3.68	.31	2.88	3.50	73.32	6.71	306.42
Fulling	.21	.80	1.56	16.27	14.70	136.96	3.44	72.07	8.40	383.67
Washing	69.92	293.31	35.55	370.02	5.63	52.49	1.76	36.87	3.06	139.70
Drying	1.36	5.69	11.03	114.92	5.60	52.20	7.07	148.11	1.28	58.44
Cloth Drying	.23	.97	1.88	19.55	.39	3.60	1.17	24.51	.19	8.83
Blanket Drying										
Jackets	.54	2.29	4.19	43.59	.50	4.66	1.34	28.07	1.03	47.11
Gigging	.14	.58	1.12	11.65	9.17	85.59	3.34	69.97	2.64	120.59
O. D. C.	.05	.20	.39	4.11	.50	4.67	3.00	62.85	3.29	150.07
Cloth Finishing	.06	.24	.46	4.78	.52	4.88	1.29	27.02	1.10	50.03
Packing and Shipping	.07	.28	.54	5.68	.48	4.47	5.43	113.75	4.34	198.21
Blanket Shipping	.05	.20	.39	4.04	.34	3.18			1.73	79.21
Waste			.09	.93	.08	.73	.88	18.44	.37	17.05
Commercial Expense									6.78	309.70
Total	100.00	419.53	100.00	1041.14	100.00	933.48	100.00	2094.93	100.00	4567.87

H. L. Wayland Co.

FORM 5.

STANDARD COST SHEET

Design	E J	Date	Finished Size	Sheet No.	Number of Sheets
Finished Weight $13\frac{3}{4}$	Nap LNT-B	Length Factor 1.02	Width Factor 1.95	Woven Size $30\frac{1}{2} \times 78$	Woven Weight 15.2
Warp Take Up 4%	Warp Yarn 59B-420	Reed 10-1	Ends 900	Filling Yarn 66 HNS-255	Picks $11\frac{1}{2}$

Standard Warp Length 6 Felts—205	Warp			Filling			Total
	Operation Cost per Pound	Yield Factor	Cost per Finished Pound	Operation Cost per Pound	Yield Factor	Cost per Finished Pound	
Wool	.6407	.806	.5164	.68065	.902	.6140	
Recovered Waste	.46	.078	.0374	.505	.092	.0465	
Net		.728	.4790		.810	.5675	1.0465
Sorting				.0206	.902	.0186	
Scouring	.0186	.806	.0150	.0159	.902	.0143	
Preparing	.0110	.588	.0065	.0119	.691	.0082	
Tanning							
Dyeing and Bleaching							
Carding	.0405	.608	.0246	.0275	.706	.0194	
Spinning	.0442	.585	.0259	.0354	.685	.0242	
Spooling	.0169	.573	.0097				
Warping	.0966	.570	.0551				
Drawing In	.029	.570	.0165				
Cop Winding				.0122	.664	.0081	
Twisting							
Total Preparation			.1533			.0928	.2461
Loom No. 56, 100 Picks per Min.:							
Weaving				.085	1.105	.0939	
Burling				.026	1.105	.0287	
Joining				.201	1.09	.2191	
Fulling				.098	1.09	.1068	
Washing				.046	1.09	.0501	
Gigging				.037	1.09	.0403	
Drying				.039	1.09	.0425	
Jackets							
Cloth Pressing and Finishing							
Packing and Shipping				.04	1.0	.04	
Total Finishing							.6214
Total Fabric Cost per Pound							.8675
Fabric Cost per Article							
O.D.C.: Labor and Burden							
Material							
Total Mill Cost per Finished Felt of $13\frac{3}{4}$ Lb.							26.32

Form 6.

H. L. Wayland Co.

article, as most appropriate. It was expected that actual cost figures would be kept continuously by departments, but not by each lot or quality of cloth; the Standard Cost sheets for different qualities were checked up from time to time by keeping actual figures on actual runs in the same form as the standard costs in Form 6. For purposes of current control, however, the departmental costs and analyses were regarded as being sufficient.

Do you consider that the analysis of expense variations from standard would be the most helpful figures obtainable?

Was it satisfactory not to keep continuous costs by types of product?

Would the omission of such cost gathering have any unfortunate effect in connection with the fixing of prices?

What would be the procedure for gathering the actual cost of a given type of product to compare with the standard costs shown in Form 6?

5. Havelock Manufacturing Corporation

MACHINE SET-UP COSTS: IN WHAT MANNER CAN SET-UP COSTS BEST BE HANDLED IN CONNECTION WITH A STANDARD COST SYSTEM?

The executives of the Havelock Manufacturing Corporation were dissatisfied with the results obtained by the method used in handling set-up costs in connection with the different production orders being put through the shop. The procedure followed was to consider those costs as direct items chargeable to each order, and thus their total amount was divided between the number of parts produced in determining the unit cost of the products. The difficulty arose because the time required in setting up for a certain operation was usually constant and did not have any relation to the number of pieces to be made, so that with different-sized lots, a different charge per piece for this work was obtained. This condition, although it was fundamentally correct, did not seem to be consistent with the standard cost methods which the company was applying to its productive activities, and it wished to know if there were any approved and satisfactory accounting methods which would take care of the problem.

In an effort to find a solution to the question, the executives talked with a number of cost accountants, who proposed several ways of handling the difficulty. It was pointed out that the easiest and probably the most satisfactory way would be to standardize the size of the lots being sent through the shop so that a regular set-up charge could be established for each piece and included as a factor in the standard cost of the article. This condition, however, could not be obtained because of variations in the sales demand for the different products.

One suggestion made was that where set-up charges were less than 5% of the total direct labor costs of a department, that they should be considered as indirect items. It was stated that this method had proved satisfactory where standard costs were used in conjunction with a budget, so that variations relative to set-up costs could be determined and used for control purposes.

A second procedure discussed was to establish an average percentage relationship between the total direct and the setting-up labor in a department and charge each job with this additional percentage of its standardized direct labor cost as its share of the setting-up expense incurred in a department. The actual costs of making the set-ups would then be charged to a special account, which would be credited with the standard allowances made on the jobs processed. This method would do away with variations shown in the unit costs of the products but would leave an under- or over-absorbed balance in the special account which would have to be charged off to Profit and Loss.

Another accountant favored making an analysis of the set-up costs in connection with each job processed. According to his method, the actual set-up costs on a job would be recorded on the Job Cost Sheet, and a regular allowance per piece processed based on a standardized production lot credited against the charge. In this way, variations in the unit costs of the articles were eliminated and the under- and over-absorbed setting-up charges handled so that the variations could be analyzed as due to changes in lot sizes, or because of the efficiency with which the work was done.

The management was not sure but what it might be advisable to use different plans in different departments, as conditions throughout the plant varied a great deal. In one department, set-up charges were a very small proportion of the total labor costs and production, as a whole, was quite regular. Conditions in another department were such that set-up costs varied a great deal, because machines set up for one job could at times be used with small changes for a second job, while at other times, a substantial period would be required to prepare the machine for the same operation. In a third department which machined large castings, as a rule, comparatively few pieces were processed on one order and the arrangement and setting-up charges for certain operations, although usually fairly constant, sometimes amounted to almost as much as the direct cost of doing the work.

In what manner should the setting-up costs be handled under the conditions found in the company?

6. Stouffer Textile Company

STANDARD COSTS: HOW SHOULD DIRECT LABOR CHARGES INCURRED IN BRINGING RAW MATERIALS TO STANDARD CONDITION BE HANDLED WHERE A COMPANY IS OPERATING ON A STANDARD COST SYSTEM?

The Stouffer Textile Company had operated under the standard cost system for several years. When the standard direct labor rates were being set up for the various departments of the organization, it was necessary to assume, of course, that the raw materials would always be purchased in a certain standard and uniform condition. After the system had been fully installed, however, trouble arose because the purchased raw material was frequently found to be in a condition substantially different from that found in the standard costs. This necessitated two additional direct labor operations other than those provided for in the costs. The question then was what disposition should be made of this direct labor cost.

The plant superintendent was of the opinion that there were only two ways in which this direct labor could be handled. The chief distinction between the two methods was that in one case this additional labor cost was treated as unabsorbed direct labor for the department in which the charge was incurred, while in the latter method, it was considered as indirect labor for that department, and finally charged to Expense. The chief objection to the former scheme was that it penalized the department for costs that it did not control. As to the latter, it was pointed out that the Expense account would be misrepresented if the company were to follow the policy of including this additional cost in indirect labor which, of course, would be closed out into the Expense account. It was obvious that such a procedure would unfairly charge items which were in no way responsible for the additional costs incurred.

Since the plant superintendent could come to no decision as to which method to adopt, he referred the matter to the accounting department. The head of this department stated that in all cases where standard costs were predetermined on certain definite conditions, it had to be understood that any variation in these conditions would bring about different standards of costs. The solution that he offered was that the inventory items in question should be charged with the additional direct labor expended on them; obviously, an addition would have to be made to the standard labor rates.

In conclusion, the head of the accounting department stated that this case was simply another instance where it must be recognized that any change in conditions must be accompanied by a corresponding change in the standard cost.

The general manager of the company agreed with the accountant in his reluctance to include it in overhead since it was liable to become concealed there on account of being entirely removed from the department in which the cost originally arose. Under these circumstances, it was improbable that adequate attention would be given to reduce or eliminate this cost. It was his belief that this additional item of cost should be classified as direct labor and charged to the department concerned. He could see no reason why this procedure should be regarded as penalizing that department so long as the item was properly designated and understood.

Still another opinion was given by one of the assistant managers. He thought that the excess direct labor cost should be charged directly to the cost of the materials concerned, so that the management might be able to compare the total cost of the sub-standard material with the cost of material of standard grade.

Discuss critically the arguments presented by the various executives.

C. THE BUDGET AS A CONTROL AGENCY

1. Government Budget—No. 1 [1]

BUDGETARY PROCEDURE: PLANS MADE BY GENERAL CHARLES G. DAWES AS DIRECTOR OF THE BUREAU OF THE BUDGET FOR THE INCEPTION OF A BUDGETARY PROCEDURE

At the beginning of his work as the Director of the Bureau of the Budget in 1921, General Dawes addressed a meeting which included the heads of all executive departments and bureaus of the government; in this address he advanced the following principles as the foundations upon which the budgetary procedure of the government was to be built:

> The permanent success of the Budget system in the United States depends upon these principles which at its inception must be so firmly established both as concepts and rules of action that they will never hereafter be questioned in this administration or in any other, for the Budget machinery must last as long as the republic.
>
> 1. The Budget Bureau must be impartial, impersonal, and non-political.
>
> 2. The Director of the Budget in the matter of governmental business administration has no responsibility under the law save for the administration of his own bureau. He is simply an adviser of the President and Congress in the matter of correcting business administration.
>
> 3. The Director of the Budget, in gathering information for the use of the President, acts for the President, and his calls upon the chiefs of bureaus and other administrative officers for purposes of consultation or information take precedence over the Cabinet head of a department, or any head of an independent organization.

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[1] *Report of the Director of the Bureau of the Budget on the Subject of Economies and Savings in Governmental Business*, May 8, 1922, Washington, Government Printing Office, 1922.

4. The Budget representative in each department, being appointed by the Cabinet head, will present to the Director of the Budget the views of the Cabinet head upon the wisdom of conclusions drawn by the Director of the Budget, for the use of the Chief Executive and Congress; but, as in the case of bureau chiefs and other officers, the call of the Director of the Budget for their presence and advice takes precedence over the Cabinet head.

In other words, gentlemen, the President is simply putting into effect for the first time in this country a condition which exists in any business corporation, whether it be a bank or a manufacturing corporation, or any other kind. The president of the corporation bears a responsibility for the whole institution, and he has the right to get information where he pleases and from any source in that corporation, whether it is from a washerwoman scrubbing the floor, or his first vice-president.

Having announced these principles, the Director, with the approval of the President, requested every cabinet officer, as executive head of his department, to name a representative with whom he could correspond and discuss all matters involving expenditures in that department. The Director was to have the right to obtain, through this representative, any information concerning the proposed expenditures of the department; and after discussion with the department heads these representatives were to act as agents of the departments in making commitments to the Director of the Budget looking to the delimitation of the department's expenses. These plans were expressed in the following regulations:

First Budget Regulations

1. The Budget officer for each department or independent establishment will secure from the head of each bureau or branch thereof responsible for the obligation of appropriations, an estimate of the portion of the funds available for the fiscal year 1922, the expenditure of which is indispensable in carrying on the activities of such bureau or branch, and the resulting balance which may be saved under each appropriation; and will submit such estimates to the head of his department or establishment for approval or modification. Upon such approval or modification by the head of the department or establishment, the estimates will be returned to the Budget officer thereof, who will communicate them to the Director of the Budget. The Director of the Budget will, in his discretion, confer directly with the head of the department or establishment, or with the chief of the

bureau or branch, with a view to a modification of the estimates, or will make recommendations in regard thereto to the President.

2. The estimated savings under the several appropriations will be submitted by the Director of the Budget to the President for his approval, and upon such approval the balance thus saved, which will be designated as a "General Reserve," will be so carried under their respective appropriation titles on the records of the Director of the Budget, and of the department or independent establishment.

3. The amount approved by the President for expenditures under an appropriation title shall be considered as the maximum available for obligation during the fiscal year. The estimates of expenditures, once approved, will be subject to further study and revision during the course of the fiscal year, and all possible additional savings therefrom will be effected. To this end the heads of bureaus and branches will maintain upon their financial records additional sums reserved from obligation so that if the developments of the fiscal year permit, these amounts may be added to the General Reserve.

The Director of the Bureau of the Budget was anxious for many reasons to begin immediately upon the task of revising departmental expenditures for the current year. As a result of conferences with the department representatives, and further investigations, the Director made the following report to the President of the Untied States, setting forth the economies which it was hoped to realize immediately, and again stating the policy of the Bureau of the Budget:

Washington, July 19, 1921.

The Honorable the President of the United States.

SIR:

The Budget and Accounting Act, 1921, provides for the presentation by you of a regular and alternative Budget of the United States to Congress on the first Monday in December, 1921, covering the fiscal year ending June 30, 1923. Recognizing in the Budget machinery created by this law an agency through which Executive policy and pressure involving better business administration could be exerted, you assembled on June 29, 1921, for the first time, the heads of departments and independent organizations and bureau chiefs, and after announcing a government policy of economy and efficiency, directed that an immediate attempt with the Budget machinery be made to reduce expenditures under the appropriations of the current year ending June 30, 1922.

I have, therefore, the honor to report $112,512,628.32 as the estimated savings in expenditures reported to me by the heads of departments and independent organizations, in compliance with your directions to all concerned to secure a reduction in expenditures under appropriations and balances available during the current fiscal year, where consistent with the mandatory obligations imposed by Congress, either direct or implied. The attached statement apportions this amount by departments and independent establishments of government. Of this amount, $22,822,113.14, pertaining to continuous appropriations and involving for the most part building and construction, will be postponed for expenditure in future years unless otherwise decided by Congress. Whatever may be the relation of total expenditures to total revenues at the end of the current year, which, for various reasons, including possible new legislation, the operations of the Shipping Board, the Railroad Administration, the fluctuations in current receipts of the Post Office Department, cannot be predicted at this time, the above amount is that much of a contribution to a more favorable relation.

This fine response to your request from the heads of departments and independent organizations and bureau chiefs, incidental to your assumption of responsibility as the business head of governmental administration, infers the existence in their minds of three principles involving improvement in governmental business, which should not be overlooked.

First, that the business organization of government hereafter assumes that the minimum amount of money to be expended in any fiscal year is not, of necessity, the sum appropriated in advance by Congress, but the smallest amount upon which the business of the government can be efficiently administered under the program outlined by Congress.

Second, that the minds of the business administrators of government have been diverted from a too easy reliance upon the custom of deficiency appropriations.

Third, that where Congress has directed the expenditure of certain sums for specific purposes, an Executive pressure will now be exerted for more efficient and economical administration in order to produce greater results from the given expenditures and also, wherever possible, to complete the given project for a less amount than the total appropriated for the purpose.

Very respectfully,

CHARLES G. DAWES.

Director of the Bureau of the Budget.

How far would the procedure and policies here described be applicable in business?

2. Government Budget—No. 2 [1]

ECONOMIES THROUGH BUDGET: REPORT ON ESTIMATED ECONOMIES AND SAVINGS IN GOVERNMENTAL BUSINESS

When the United States Bureau of the Budget had been in operation, a report was made of its activities, from which the following excerpts are taken:

Report

The following report is submitted in compliance with the request of the chairman of the House Committee on Appropriations for the transmission of information requested in pending House Resolution 285 in the following words:

> Now, therefore, be it——
>
> Resolved, That the President be, and he is hereby, respectfully requested, if not incompatible with the public interest, to inform the House in what way these savings have been made (referring to savings heretofore estimated by the Bureau of the Budget in connection with expenditures for 1922) and from what particular appropriations heretofore made by Congress, and in what specific amounts.

and the instructions of the President, outlined in his letter, to "convey such a statement of facts bearing thereon as may insure a consideration of the entire situation, thus obviating possible misconceptions which might arise from any partial or incomplete statement."

Imposition of Executive Plan and Pressure the Cause of Improvement in Business Administration

As has been continually pointed out in his official reports by the Director of the Budget, the prime and essential cause of the economies and improvements in administration which have been effected during the present fiscal year in the conduct of the routine business of Government has been the assumption by the President of the United States of his full responsibilities as the head of the business organization of Government. Some of the agencies for the transmission of Executive pressure, plan, and policy have been established upon the advice of the Director of the Budget, and the President has used the Budget Bureau itself among his other agencies for the imposition of Executive policy. But the activities of the Budget Bureau may be considered as simply incidental to the change in Executive attitude.

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[1] *Report of the Director of the Bureau of the Budget on the Subject of Economies and Savings in Governmental Business,* May 8, 1922, Washington Government Printing Office, 1922.

The results accomplished, while primarily due to this Executive pressure, could not have been achieved without the cooperation of the rank and file of Government employees who have commendably responded to the directions of the President as transmitted to them by the heads of the departments and establishments. Numerous examples of the interest and ingenuity which have been exhibited by the individual employee in office and field have come to the attention of this office, and this spirit, no less than that of the head of the department or establishment, has been a factor contributing to the savings accomplished.

Compliance with the direction of the President that the information desired in House Resolution 285 be furnished with such other facts as will give a bird's-eye view of the accomplishments of all departments and establishments of the Government, working for the first time under Executive plan and policy, requires that this report cover, as far as possible, the results of the work of the entire Government business organization.

As will be noted in the body of the report which follows, the expenditures of the Government for the fiscal year 1922 have been reduced in a present estimated amount of over $1,600,000,000 from the 1921 figures. Only a portion of this large reduction in expenditures, however, can be properly attributed to the imposition of a unified plan and policy upon the business organization of Government.

Method by Which Real Savings Should Be Determined

In considering, therefore, the reduction in actual expenditures in 1922 as compared with 1921, in order to appraise at this time what is attributable to the change in operating methods and to get a clear perception of what has actually been accomplished in economy, as distinguished from the postponement of expenditures and a reduction of expenditures incident to operations in capital funds, it is necessary to consider the method under which we should determine real "savings." Misconceptions of what has been done are very easy to create in either direction. Those who would desire to unduly magnify the improving effects of the imposition of Executive plan and pressure need only to refer to the reduction in actual cash expenditures. Those who desire to unduly minimize the beneficial results of the new Executive plan of management of governmental business will attempt to impose other arbitrary bases for the estimation of economies which are unjustifiable from a business standpoint.

In treating governmental business questions the clarifying method is always reached through the adoption of the point of view which would be taken in a private enterprise confronting analogous conditions in its business. The idea that governmental business can be successfully administered under a different set of principles or different methods from private business is a fallacy which has already cost this Government too dearly to be further encouraged as a basis for partisan discussion.

Relation of Congressional Appropriations to the Subject of Savings

An appropriation by Congress is simply an authorization of expenditure. If Congress overestimates the necessity for expenditure and makes an overappropriation it does not necessarily follow that the unspent portion of an appropriation is a real saving. On the other hand, if Congress underestimates the necessity for expenditure in its appropriations it does not follow that an excess expenditure by a department is necessarily an evidence of extravagance. Where a portion of a given appropriation is unspent it may indicate a saving, provided the money was unspent because of more economical and efficient functioning of a governmental activity. In like manner, where, in expenditure, a fixed congressional appropriation has been exceeded, it may represent extravagance if the excess expenditure was occasioned by the inefficient functioning of a governmental activity.

Indirect savings, resulting from such improvements in the functioning of governmental business activities as make unnecessary the expenditure of money which otherwise would have to be appropriated by Congress, must be determined by consideration of the facts, without any reference whatever to the subject of congressional appropriations. The question of the relation of appropriations to the subject of real savings is only incidental as being one of the factors discussed in consideration of the actual facts relating to the savings under discussion. If the only factor to be considered in estimating real savings was the relation of actual expenditures to the appropriation program outlined by Congress, all it would be necessary to do to apparently save money would be, at the beginning of any fiscal year, to make appropriations so large that under no possibility could all of them be spent and thereby, at the end of the year, "save" the unspent portion of the appropriation, incidentally avoiding any deficiency appropriation. Deficiency appropriations, therefore, are not necessarily the evidence of extravagance, nor is the unspent portion of appropriations necessarily an evidence of economy.

In a private business fixed appropriations are always considered as the maximum of the amount of money to be spent in administration, never the minimum, as has been the case in Government. While in private business appropriation limitations are imposed to check extravagance, they are not allowed to operate either to prevent economy or to destroy efficiency. Appropriation limits in congressional efforts to secure real economy in administration in the past have failed, because the departments, unsubjected to Executive pressure, have organized themselves to spend the maximum amount appropriated and then, up to this year, have practically relaxed efforts to save under it. An authorized standard of expenditures in Government, based upon appropriations, without intervening Executive supervision, is fatal to economy. From the beginning of our Government, for proper business administration, there should have been interposed, as there is at the present time, Executive control and Executive responsibility over the business organization, and between the business organization and the congressional appropriating power.

Purpose of This Report

This report is an effort to determine what the real savings of Government have been during the current fiscal year. Economies and savings will be estimated as similar ones would be in private business organization—by consideration of the facts which are involved.

Admiral R. E. Coontz, Budget officer of the Navy Department, in a circular to the bureaus and offices of the Navy Department, well states the general principles which the Director of the Budget has emphasized in requesting the information forming the basis of this report. He states:

> 2. It is well recognized that the problem is hypothetical, and that many of the administrative measures forming the basis for the items are largely intangible. It is also recognized that a consideration of annual appropriations themselves, obligations themselves, or cash withdrawals from the Treasury themselves, and their comparisons with similar items of other years, are not properly a measure of economy, except insofar as the operating conditions and the work performed are identical. It is recognized further that corrective administrative action in the interest of economy is only applicable to cases in which there is something to correct without sacrificing efficiency.
>
> 3. The figures are desired not as a support for the operation of the Bureau of the Budget itself, but as a support of the administrative methods of the whole business organization of the Government of the present administration in tackling the problem of economy in Government expenditures. This department is, of course, a part of the general business organization. It was clearly indicated by the Director of the Bureau of the Budget that most of the measures of economy have been placed in effect in the departments themselves, and that it is desired to give all of the departments their just share in the credit for such measures; while the Bureau of the Budget, with its subsidiary offices, furnishes means for interdepartmental economies.
>
> 4. To this end, it is requested that all of the bureaus and offices of the Navy Department endeavor to transmute into estimated

> money values the savings which have been initiated, and the economies effected as applied to the fiscal year 1922. The statements should be conservative, since it is not advisable to overstate the value of administrative measures: First, because the estimates made must be capable of reasonable substantiation; and, second, because at the end of the year, when the accounts come in, the savings may not be as great as now estimated.

The estimates of this report relate to the largest business in the world, conducted over a great territory. The machinery of investigation is limited, and even were it not limited the short time available for preparation involves the liability of some error in estimates. The governmental business machine has, for the present fiscal year, functioned for the first time with a sense of responsibility to a central control, with resulting marked improvement, the full extent of which can only be developed by time.

The Bureau of the Budget is an impersonal, impartial, and nonpartisan business agent. In this particular report where its estimates may become a basis of contention in an approaching political contest, its figures should be conservative and meet the test of examination, not only in the present but in the future when existing partisan differences are forgotten and the record for impartiality and nonpartisanship of the Budget Bureau is considered in retrospect by the unprejudiced mind of the governmental economist and student. It will be noted from the table covering gross expenditures and estimates that the Director of the Budget, out of total estimated expenditures of $3,922,372,030 for 1922, classifies only $1,765,875,672 as being generally subject to Executive control in the operation of the routine business of Government. These figures compare with actual expenditures under the same categories in 1921 of $2,673,435,079.77, segregated out of a total annual expenditure for 1921 of $5,538,040,689.30. The reduction in the ordinary expenditures for the operation of the routine business of Government generally subject to Executive control in 1922 as compared with 1921 will be, therefore, in the neighborhood of $907,500,000. As against this enormous total reduction the estimate of economies and savings incident to the new imposition of Executive control over governmental expenditures in 1922 is estimated by the Director of the Budget in this report at the lesser sum of $250,134,835.03. He feels reasonably assured that this estimate of economies and savings attributable to the new system is an underestimate, but that if an error has been made in this regard the savings and economies are still so large as to vindicate it, and will at the same time emphasize the indispensable policy of the Budget Bureau to have its estimates conformable to the principles of business conservatism. In these figures the Director of the Budget has found it impossible to make any reliable estimate of some indefinite general savings, such as those incident to the corrected system of purchasing which has been established in the Government, by which competition between departments and the overlapping and acquiring of unnecessary surplus has been avoided. On the basis of the original estimates made by the different departments and establishments there have been eliminated, after due consideration of the facts involved, in the neighborhood of $150,000,000 claimed economies.

Were the methods of estimating the probable savings reasonable?

Were the policies expressed in this report consistent with those announced earlier, as reported on pages 289–292.

3. Birch Engineering Equipment Corporation—No. 2

BUDGETED COSTS: DOES THE USE OF STANDARD OR BUDGETED COSTS FURNISH SUFFICIENT ADDITIONAL INFORMATION TO MAKE THEM WORTH WHILE?

The Birch Engineering Equipment Corporation was engaged chiefly in the manufacture of auxiliary power plant equipment; one division of their organization, however, was used to produce brass tubes for piping and equipment assembly work. A firm of consulting engineers had recommended that the factory produce for stock instead of for order as was being done, to obtain the economies of operation inherent in mass production; in conjunction with this change they advocated the complete revision of the existing cost system.

In their review of the procedure being carried out by the company they found that monthly reports made up were figured on the basis of average costs. These average costs were calculated by dividing the total of the material, labor, and burden expense for the period by the number of pounds produced.

The material cost included the cost of the virgin metal and of scrap used, at a weighted average price for the virgin metals, and an allowance for the price fluctuations and make-up of the scrap. The scrap on hand was also carried on the books at this price, while the consultants believed that it should have been carried at scrap value. They pointed out that when large amounts of scrap were on hand a false profit would be shown;

but their chief objection was that this method did not indicate to the management the savings made possible by the use of scrap, and handicapped the brass casting department in showing economies.

General expenses were distributed in the month in which the expenditures took place and, as they had no relation to production, the average cost for the different months varied accordingly.

No distinction was made in cost calculations between the different varieties of tubes produced, although there was a distinct difference in the time taken and equipment necessary for them.

There was no tie-in between the monthly cost reports made up for the executives and the yearly financial statements. According to the monthly statements a profit for the year might be expected, which would be turned into a loss on the yearly statements because of the method of inventory valuation. Monthly statements were made up on the basis of the average costs while the yearly statements had the inventories valued at a normal cost which had been developed in 1920 and which had only been adjusted for the difference in expenses between the years. As processes and operations had materially changed, a corresponding error was now being included in the accounts.

Departments were being compared on the basis of total costs instead of a cost per unit of production which, it was pointed out, tended to make the foremen keep the total expenses down when they might by increasing the expenses slightly operate at a far higher efficiency.

The consultants thought that the costs obtained were of no value to the sales department or in controlling the operations of the business; and the department executives had lost faith in cost figures because of the peculiar results obtained. The engineers believed that the prime reasons for keeping costs were to aid department executives to (1) effect economies and prevent waste, and (2) note promptly the effect of changes in policies, as to whether their subordinates were executing them correctly and with what results. Prices, they maintained, were set in a whirl of competition, but profits were obtained at current prices by controlling operations so as to produce at a cost below the sales price.

As the cost system operated by the company did not meet the requirements which they thought necessary, they recommended the following procedure, incorporating standard costs, which they believed would give the desired information.

1. The first step in the development of the system was the establishment of a separate Cost Ledger and the division of the shop into cost centers where standard types of work were done. There would be a separate sheet in the ledger for each cost center made up as shown in Exhibit 1, on which the items of expense chargeable to the center would be divided into controllable and noncontrollable costs.

Exhibit 1

225,000-Pound Center

COST LEDGER SHEET

	Budget		January Month	February Month	Year to Date
	Year	Month			
Controllable Items:					
Supplies	$ 12,000	$ 1,000	$ 900	$ 850	$ 1,750
Repairs	3,000	250	230	300	530
Payroll—Indirect Labor	24,000	2,000	2,000	1,800	3,800
—Direct Labor	96,000	8,000	4,100	7,150	11,250
Share —Maintenance	6,000	500	550	600	1,150
—Power	10,200	850	800	700	1,500
—Compensation Insurance	300	25	25	25	50
Sub-total	$151,500	$12,625	$ 8,605	$11,425	$20,030
Uncontrollable Items:					
Share—Building Expense	$ 4,800	$ 400	$ 400	$ 400	$ 800
—Taxes, Insurance Depreciation and Interest on Investment	16,500	1,375	1,375	1,375	2,750
—Laboratory	1,200	100	150	200	350
—General Expense	6,000	500	700	1,100	1,800
Sub-total	$ 28,500	$ 2,375	$ 2,625	$ 3,075	$ 5,700
Total	$180,000	$15,000			
Normal Number of Hours Worked	180,000	15,000			
Standard Cost per Hour		$1.00			
Standard Hours Earned			12,000	10,500	22,500
Total Actual Cost			$11,230	$14,500	$25,730
Total Standard Cost Allowed			12,000	10,500	22,500
Gain or Loss			770	4,000*	3,230*
Hours Lost Due to Productive Efficiency		Gain	1,400	2,000*	600*
Repairs and Planning			200*	500*	700*
Lack of Sales			3,000*	2,000*	5,000*
Difference in Expense:					
Controllable Items			$4,020	$1,200	$5.220
Uncontrollable Items			250*	700*	950*

* Loss.

2. On the basis of these budgeted expenses and the normal number of hours operated per year, the standard operation cost per hour for each center would be determined.

3. These standard rates applied to the standard times set for the different operations on the tubes would give the standard costs of doing the jobs. For each variety of tube a standard cost card was to be made up showing all this information.

4. Each department was to report daily the work which it had completed and, if desirable, it could be arranged so that the superintendent would be informed on the following day just what jobs were not being done in standard time. Any time lost by a department because of breakdowns, lack of work, or other reasons was also reported so that it was possible to account for all of the productive time available to the department.

5. The Manufacturing orders completed by a department were posted daily to a Summary Sheet which was totaled either weekly or monthly and gave the standard cost of all work completed. This amount was then credited to the production center on its Cost Sheet.

6. Through the Voucher Register the actual expenses for the period were to be distributed to the different production centers and recorded on the Cost sheets, thus comparing the actual and the budgeted figures.

7. The difference between the earned production at standard cost and the total of the actual expenses was considered to be the profit or loss made on the operation of that center during the month.

As an example of the analysis of operations in a department that might be obtained under the system suggested, the consultants used the Cost Ledger Sheet given in Exhibit 1. This sheet was made up for the 225,000-pound center where certain standardized work connected with the drawing of tubes was done. It was determined that at normal capacity the center would operate 180,000 machine-hours per year at a budgeted cost of $180,000, giving a standard cost rate per machine hour of $1.

Considering the figures for the month of February, from the manufacturing orders which were summarized, it was determined that the total number of machine-hours worked was 13,000, during which time they completed jobs on which the standard time set was 10,500 hours, and thus the center was credited with having earned in productive work $10,500. The actual expenses for the period were given as $14,500, and, therefore, there had been incurred a loss of $4,000, which may be analyzed as follows:

Loss due to productive efficiency:

Total hours worked	13,000
Standard hours earned	10,500
Loss in manufacturing	2,500

This figure of 2,500 hours may be further broken down into three items:

Failure to produce at standard rate	2,000	hours
Delay due to breakdowns	200	"
Faulty planning	300	"
	2,500	"

Through the manufacturing orders returned, these losses were to be traced down at the time they occurred to particular benches and crews and to the products being made.

The budgeted production was 15,000 hours for the month, actually 13,000 hours were worked, which gives 2,000 hours' loss due to lack of orders, or the equivalent of $2,000. Actual expenses were $14,500, which was a $500 decrease over the budgeted expenditure of $15,000 which is accounted for, as shown on the Cost sheet, by a decrease in controllable items of $1,200, an increase in the non-controllable items of $700, giving the net decrease of $500.

The results of operations for the month could then be summarized as follows:

Losses:	
Failure to produce at standard rate	$2,000
Faulty planning	300
Breakdowns	200
Total Manufacturing Loss	$2,500
Lack of sales	$2,000
Fixed and general expense	700
Total Loss	$5,200
Gains:	
Decrease in controllable expense	$1,200
Net Loss	$4,000

The consultants pointed out that this system would give the managing directors the information they needed to control operations in the shop. It would also give them accurate costs on all the varieties of tubes produced, thus furnishing the sales department with data on which they could base prices or determine whether it was profitable to accept certain orders or not. The Cost records would be tied in with the Financial accounts, and accurate monthly statements would be obtained on which the status of the tube business could be judged.

Would the adoption of the machine-hour units help to solve the cost problems of the company?

Would the analysis of time lost be helpful?

Do you agree that the cost figures previously used might have had the undesirable effects referred to?

4. Daventry Automobile Company

DEALER'S BUDGET: HOW MAY AN AUTOMOBILE DEALER MAKE THE BEST USE OF BUDGET INFORMATION SUPPLIED BY THE MANUFACTURER?

The Daventry Automobile Company was a dealer in Hamilton cars, making sales of approximately 100 cars per annum. The manufacturers of Hamilton cars had furnished the Daventry Company a manual descriptive of a budget system, which the manufacturers supplied as part of an extensive service to all their dealers. Mr. H. S. Rotzel, the president and principal owner of the Daventry Automobile Company, noted especially in the introductory material of the manual the statement that "many businesses do not enjoy the benefit of adequate accounting chiefly because they do not expect enough from the accountants in charge of the work." He was anxious to exploit every mean of improving his business, and made a careful study of the forms and information contained in the manual.

The forms provided included especially a statement of Sales and Gross Profits (Form 1), a detailed statement of Expenses (Form 2), and a Summary of Gross Profits, Expenses, and Net Profits (Form 3).

A set of these forms was offered for a dealer handling 25 cars, and similar sets for dealers handling various quantities up to 1,000 cars per year. Each of these sets was filled in, as indicated, with standard figures for sales income and expenses corresponding to the volume of business for which the set was prepared. It was, therefore, expected that the dealer would select that set to which his own sales most closely conformed, and then would keep records of his actual income and expenses, to be compared with the standard or budgeted figures. The Hamilton Company had had extensive experience through large numbers of dealers, and believed that the standard figures they supplied were sufficiently reliable to notify a dealer using them when any items were markedly out of line. If a dealer's sales fell between the quantities for which schedules were provided in the manual, the dealer was recommended to take his estimated number of new cars to be sold during the coming year, and to multiply this figure by the average sale price per car, as shown by past experience, thereby arriving at the volume of estimated sales in dollars. From this amount the dealer would then compute an estimated cost of sales, and estimated expenses, by using the percentages indicated in the budget table for the quantity nearest to his own estimates. The yearly figures would thereby be completed and monthly figures might be calculated from these which would serve as a basis for comparison with the records of actual expenses.

Dealers were urged to make the most of this budget information, and of the comparisons with their new figures, on the ground that a budget was of even greater value to a small business than to a large one, seeing that the latter could employ experts to control its various departments, but the proprietor of the small business needed to expand his own experience by utilizing all the outside information he could obtain. It was maintained that the value of the budget did not, as was often supposed, depend upon making an absolutely accurate estimate of sales; in fact, the information supplied was of sufficiently wide range and flexible enough to furnish comparisons for any volume of business which would be likely to develop; in any case miscellaneous income, such as from accessories or general garage service, was sufficiently variable to make it impossible to get an exact estimate of sales. In the absence of considerable change, therefore, dealers were recommended to use their actual sales figures for the previous year as the basis for the budget of the current year.

RETAIL BUDGET—100 NEW CARS PER YEAR REDUCED TO ONE AVERAGE MONTH

SALES AND GROSS PROFITS

Line No.	Accounts	Retail				
		Sales		Cost of Sales	Gross Profit	
		Number of Cars	Amount		Amount	Per cent of Sales
	New Cars					
1	Model D........................	1.33	$1,385.95	$1,053.32	$ 332.63	24.00
2	Model S........................	.67	955.61	692.71	262.90	27.51
3	Model K........................	3.33	5,591.37	4,198.51	1,392.86	24.91
4	Model O........................	3.00	5,639.77	4,516.18	1,123.59	19.92
5						
6						
7	Total new cars, lines 1 to 6, incl.......	8.33	13,572.70	10,460.72	3, 111.98	22.93
8	Net miscellaneous from line 36.......			Deduct 42.80	Add 42.80	.32
9	Total, new cars..................		13,572.70	10,417.92	3,154.78	23.24
	Miscellaneous on New Cars					
10	Freight on new cars..................		673.19	500.93	172.26	25.59
11	Preparation of new cars..............		271.42	139.16	132.26	48.73
12	Excise tax........................					
13	Total, new cars and miscellaneous, lines 1 to 12, incl.....................		14,517.31	11,058.01	3,459.30	23.83
	Parts Department					
14	Parts sales........................		940.84	517.48	422.81	44.94
15	Accessories and misc. Mdse......... {		219.42 1,160.26 689.41	172.29 689.77 468.35	47.07 469.88 220.17	21.45 40.50 31.94
16	Gas, Oil, and Grease................		104.25	77.52	25.71	24.66
17	"Outside Work"...................		110.91	88.32	22.01	19.84
18	Total Parts Dept., Lines 14 to 17, incl..		2,064.83	1,323.96	737.77	35.73
19	Grand Total, Lines 13 and 18........		16,682.14	12,381.97	4,197.07	25.16
20	Used cars........................					
21	Repossessed cars....................					
22	Total Used and Repossessed.........	12.5	7,010.50	7,552.00	542.50	7.74
23	Grand Total Gross Profit less Used Car Loss, lines 19 and 22..............				3,644.57	26.85

Daventry Automobile Co.

Per Cent of New Car Sales, Retail, Line 7

FORM 1.

In this connection they were advised that, at any particular sales volume, the total business done could usually be increased up to about 30% without increasing the fixed charges; such periods of expanding business furnished some of the best profits to be obtained by the dealer, and the budget might be expected to assist him to take full advantage of such opportunities.

The following (condensed) instructions were included in the advice to the dealers on the use of the budget schedules.

RETAIL BUDGET—100 NEW CARS PER YEAR REDUCED TO ONE AVERAGE MONTH

Expenses

Acct. No.	Accounts	Retail						
		Total Retail Ex. Service Dept.		New Car	Used Car	Parts Dept.	Service Dept.	
		Amounts	Per Cent New Car Sales Retail Line 7	Use When Departmental Analysis is Desired			Amounts	Per Cent Service Labor Sales Line 28
	All Expenses Ex. Service Dept.	Column 1		Column 2	Column 3	Column 4	Column 5	
101	Salaries, Office and Administration	584.25	4.30					
102	Salaries and Commission on Sales	682.90	5.04					
103	Traveling and Entertaining	24.77	.18					
104	Rent, including Taxes and Insurance on Bldgs.	340.35	2.51					
105	Office Supplies and Stationery	35.80	.26					
106	Postage	6.85	.05					
107	Telephone and Telegraph	33.11	.24					
108	Taxes, except Income and "Rent"	33.10	.24					
109	Donations and Subscriptions	11.03	.08					
110	Insurance except "Rent"	64.10	.47					
111	Bad Debts	27.55	.23					
112	Heat, Light, Water, and Power	62.76	.46					
113	Freight, Express, and Cartage	19.05	.14					
114	Advertising	411.07	3.03					
115	Repairs to Bldg. and Equip't	17.90	.13					
116	Demonstrating	94.21	.69					

	This account shows the difference if any, between actual cost of preparation and estimated per car cost of same shown in total under cost of sales.							
117	Preparation of New Cars..........................	6.85	.05					
118	Depreciation..	11.07	.08					
119	Free Repairs..	242.90	1.79					
120	Service Dept. Overhead Charged Here (if any)........							
	This will be a red or credit figure if used at all.							
121	Cr. Gen'l Expense Charged to Service Dept. (if any)...							
122	Interest Expense....................................	78.59	.58					
125	All Other Items.......................................	28.95	.21					
	Service Dept. Expenses *Used on customer's jobs only. Company jobs not included.*							
130	Productive Labor....................................						445.50	37.99
131	Non-productive Labor...............................						327.15	27.90
132	Shop Supplies..						41.14	3.51
133	Repairs to Mach., Tools, Equip't..................						23.31	1.99
134	Heat, Light, Water, and Power.....................						33.44	2.85
135	Rent, Including Taxes and Insurance on Bldgs.......						117.26	10.00
136	Service and Tow Cars................................						23.41	2.00
137	Depreciation...						35.11	2.99
138	General Expense Charged to Service Dept. (if any)......							
	This will be a red or credit figure if used at all.							
139	Cr. Service Dept. Overhead Charged to Other Dept. (if any)..							
140	Miscellaneous Expense..............................						11.72	1.00
	Total Expenses..	2,817.16	20.75				1,058.04	90.23

Daventry Automobile Co.

FORM 2.

SUMMARY OF GROSS PROFITS, EXPENSES, AND NET PROFITS

	Gross Profit	Expenses from Form 58	Net Profit	
			Amount	Per Cent New Car Sales Retail Line 7
24 New Car Retail.....	From Line 13 3,459.30	From Col. 2		
25 Parts Dept. Retail...	From Line 18 737.77	From Col. 4		
26 Used Car...........	From Line 22 *Loss* 542.50	From Col. 3		
27 Total Retail Except Service Dept......	From Line 23 3,644.57	From Col. 7 2,817.16	827.41	6.09
28 Service Dept........	Sales 1,172.60	From Col. 5 1,058.04	114.56	.84
29 Total Retail........			941.97	6.93
30 Wholesale...........				
31 Retail and Wholesale				
32 Net Misc............	From Line 39			
33 Profit before Tax.....				
34 Federal Tax.........				
35 State Inc. Tax.......				
40 Net Profit..........				

Accounts Affecting Gross Profits		
On New Cars	Dr.	Cr.
Special Disc. on New Cars	230.91	
Task Discount		273.71
36 Net Amount to Line 8		42.80
Miscellaneous Additions		
Interest Earned		
Cash Discount Earned		
37 Total		
Miscellaneous Deductions		
Cash Discount Allowed		
38 Total		
39 Net Miscellaneous (Additions) (Deductions)		

Daventry Automobile Co.

FORM 3.

If a dealer is carrying on both wholesale and retail operations, the two should be accounted for separately; wholesale business is carried on with a gross margin of approximately 3% and an expense ratio of 2%; a retail department, on the other hand, will make nearly 30% gross profit, and incur operating expenses something over 20%. No comparisons would, therefore, be possible between the budget figures supplied by the manufacturer and those of the individual dealer if the latter had combined wholesale and retail business.

Sales—New Cars. Lines 1-4 of Form 1 should record sales of new cars at list prices, and should not include additions for freight or other extra charges, nor deductions for special allowances to customers; the latter should be entered in an account entitled "Special Discounts on New Car Sales." In this way cars at list prices will be maintained as the basis for computing all percentages and special allowances will receive notice as a separate figure instead of being concealed in the sales figure.

Cost of Sales—New Cars. This figure should be entered at the invoice price from the manufacturer for cars only, and should not include charges from the manufacturer for freight or other items.

Gross Profit on New Cars. If sales and cost of sales have been recorded as directed in the preceding paragraphs, the gross profit will now show a percentage exactly equal to that provided in the contract between the manufacturer and the dealer.

Freight on New Cars. On line 10 of Form 1 will be entered charges to customers for freight, amounts paid to factory, and resulting gross profit on freight. It is recommended that customers be billed for freight 33 1/3% more than the factory charge to the dealer.

Preparation of New Cars. It is expected that a standard charge of $30 per car will be included in the delivered price charge to the customers, and that the cost of preparation for delivery will be about $20 per car, thus allowing a profit of 33 1/3% on amounts billed to customers.

Parts Sales. Since many dealers sell parts both at list, and with trade discounts, it is recommended that two accounts be kept, one for the former and one for the latter; in each account the sales value will be credited and the cost value of parts sold debited.

Used and Repossessed Cars. A loss is often taken on used cars which is usually stated by crediting sales with the amount obtained, and charging cost of sales at the trade-in allowance plus cost of repairs; the latter item includes labor and parts only, but no overhead. This practice rests upon the theory that the dealer does not carry on this part of his business for a profit, but only as incidental to the sale of new cars. Not only should the losses actually sustained on used cars sold be taken account of in this way, but it is necessary also to set up a reserve for the probable loss on used cars on hand and not sold. This may be computed either by estimating what each car will fetch on sale, or by computing the average loss on used cars for the past period. The budget manual recommended that the computation be made on both these bases and that the larger figure be adopted.

It was recommended that no attempt be made to budget or account for expenses in detail on a departmental basis corresponding to new car, used car, and accessories business. The manufacturers believed from their experience that such accounting by departments was in practice too uncertain for its results to be of much value, and that in any case nothing could be accomplished in this direction until the expenses for the entire business had been budgeted satisfactorily for some time.

The schedule of accounts shown in Form 3 was said to be the one commonly used in the industry; naturally, local conditions might call for special accounts occasionally, but it was advised that they be avoided as far as possible.

With regard to transfers of materials and parts between departments, it was recommended that such transfers be made at the invoice cost, and that no additions be made for overhead charges of the department first handling the materials. If such charges for overhead were included by a dealer in any interdepartmental transfers, the manufacturers asked that they be set up in a separate account in order that the regular direct accounts would not thereby be complicated with figures which would confuse the results when they were combined with other figures by the manufacturer.

In view of the fact that the inventory of used cars would frequently increase, while the commissions paid on used car sales would decrease, it was suggested that a reserve be set up to cover commissions to be paid when the used cars on hand would be sold. In this way Account No. 102—Commissions, would be charged not only for the commissions actually paid during the month, but also for the amount credited in the Reserve account.

In addition to the expense budgets offered for dealers of different sizes, a schedule was presented showing the probable capital set-up for a dealer selling 300 new cars per year. This budget was set up on three bases:

1. Assuming minimum bank loan and extensive financing of new cars with finance company.
2. Assuming maximum bank loan and no financing with the finance company.
3. An absolute minimum on which such a business could be conducted.

Each of the first two bases showed a net investment by the proprietor of about $75,000 with liabilities in the neighborhood of $40,000; the minimum set-up called for an investment by the proprietor of $50,000, and a like amount of credit on accounts and notes payable and from the finance company.

Would you advise a dealer to make use of this budget material? If so, in what way, and for what purpose? If not, why not?

If a dealer wished to avail himself of this material, what steps would he have to take?

Do you agree with the recommendation against dividing the business into departments?

5. Lang Chemical Company

BUDGET CONTENT: TO WHAT EXTENT SHOULD A BUDGET ALLOW FOR CHANGING CONDITIONS?

In order to secure better control of its manufacturing and financial operations, the management of the Lang Chemical Company several years ago installed a budget system drawn up by its chief accountant similar to Form 1.

The figures used in the budget were the best available estimates of the various expenses during the budget year. The first six lines of the budget form gave compilations of the investments in land, buildings, building fixtures, furniture, utensils, machinery, and motor trucks. The following six lines showed statistics used for the distribution of expenses between departments. The next section of the compilation sheet indicated the charges to departments, based upon the statistics at the top. For example, $100,000 was the investment in land. Interest on this figure at 6% was charged to the manufacturing department for the year. The interest charge was divided among the de-

BUDGET OF UNCONTROLLABLE EXPENSES

Period Beginning July 1 Computed for One Year

Totals	Item	REDISTRIBUTED CHARGES								
		Power Plant	Building Service	Telephone Service	Laboratories	Chemicals	Print	Box	Administration	Garage
$ 100,000	Investment in Land	$ 3,000	....	$ 50	$ 30,000	$ 10,000	$ 3,000	$ 4,000	$ 34,950	$15,000
700,000	Investment in Buildings	45,000	....	400	250,000	80,000	23,000	25,000	260,000	16,600
90,000	Investment in Building Fixtures	....	....	50	34,000	11,000	3,000	3,950	38,000	
400,000	Investment in Furniture, Utensils and Machinery	....	....	....	150,000	37,000	46,000	15,000	150,000	2,000
30,000	Investment in Motor Trucks	....	....	....	....	....	....	....	....	30,000
$1,320,000	Total Investment	$48,000	....	$ 500	$464,000	$138,000	$75,000	$47,950	$482,950	$63,600
240,000	Chargeable Area in Square Feet	....	....	100	90,000	30,000	8,000	9,900	102,000	
	Per Cent of Total Chargeable Area									
300	Horse Power Installed, Electric	....	100	....	120	30	30	10	10	
80	Inside Telephones Installed	1	1	....	10	5	1	1	60	1
400	Average Number of Employees (Exclusive of Office)	4	20	4	200	62	20	10	70	10
$ 420,000	Average Payroll	$ 5,000	$23,000	$2,000	$180,000	$ 50,000	$49,000	$16,000	$ 80,000	$15,000
	Expense									
$ 6,000	Interest on Land Investment at 6%	$ 180	....	$ 3	$ 1,800	$ 600	$ 180	$ 240	$ 2,097	$ 900
42,000	Interest on Building Investment at 6%	2,700	....	24	15,000	4,800	1,380	1,500	15,600	996
14,000	Depreciation on Buildings at 2%	900	....	8	5,000	1,600	460	500	5,200	332
13.000	Taxes on Real Estate	800	....	7	4,500	1,500	400	493	5,000	300
6,000	Maintenance and Repairs of Buildings	100	....	....	2,200	700	200	200	2,500	100
500	Insurance, Fire (Buildings)	10	....	1	200	50	10	20	200	9
800	Insurance, Occupancy	....	....	....	300	100	30	30	340	
80	Insurance, Spur Track	....	....	....	30	10	2	3	35	
40	Insurance, Sprinkler	....	....	....	15	5	....	....	20	
80	Insurance, Elevator	....	....	....	30	10	10	10	20	
$ 82,500	Total Rent Charged	$ 4,690	....	$ 43	$ 29,075	$ 9,375	$ 2,672	$ 2,996	$ 31,012	$ 2,637
600	Maintenance and Repairs of Equipment	600								
3,500	Supplies and Incidentals	500	$ 3,000							
20,000	Fuel Oil	20,000								
5,000	Salaries, Engineers and Firemen	5,000								
5,000	Salaries, Caretakers	....	5,000							
5,000	Salaries, Watchmen	....	5,000							
6,000	Salaries, Elevator Operators	....	6,000							
6,000	Salaries, Yardmen	....	6,000							
500	Purchased Power	500								
50	Insurance, Boiler	50								
30	Insurance, Fly-Wheel	30								
3,000	Water	600	....	....	1,000	300	100	100	850	50
2,000	Truck Hire from Cartage Dept.	....	2,000							
30	Special Telephone Charge	10	20							
	Distribution of Power Charges									
	$4,797 Light 15%	....	....	7	2,000	600	200	200	1,790	

	9,594 Heat 30%			10	3,000	1,000	300	300	4,000	984
	7,995 Power, Electric 25%		2,000		3,800	700	900	250	345	
	6,396 Power, Steam 20%				5,000	900		400	96	
	3,198 Refrigeration 10%									
$ 139,210	Total	$31,980	$29,020							
3,198	Less Refrigeration	3,198								
8,000	Less Credits to Building Service, Salvage, etc.		8,000							
	Total Balance Redistributed	$28,782	$21,020							
	Distribution of Building Service Charges			20	8,000	2,500	700	800	9,000	
$ 128,012	Total Rent, Light, Heat and Power			$ 80	$ 51,875	$ 15,375	$ 4,872	$ 5,046	$ 47,093	$ 3,671
100	Telephone, Trunk Line Service			100						
1,300	Telephone, Auxiliary Service			1,300						
2,000	Telephone, Excess Service			2,000						
100	Telephone, Moving Expense			100						
2,200	Telephone, Operators' Salaries			2,200						
$ 133,712	Total Telephone Expense			$5,780						
30	Less Special Telephone Charges			30						
$ 133,682	Balance			$5,750						
	Distribution of Telephone Charges				400	260	20	20	5,000	50
1,400	Department Water Tax				1,300	100				
1,400	Department Insurance, Fire				500	100	200	50	500	50
4,000	Department Taxes, Personal Property				1,460	300	500	140	1,400	200
$ 140,482	Grand Total				$ 55,535	$ 16,135	$ 5,592	$ 5,256	$ 53,993	$3,971
100 Per Cent	Departmental Per Cents of Burden				39.6%	11.5%	4.0%	3.7%	38.4%	2.8%

RECAPITULATION BY FACTORS

Sq. Ft. Rate per Month	Totals	Factor	Yearly Sq. Ft. Rate						
$0.0261	$75,130	Rent	$0.3130	$29,075	$ 9,375	$2,672	$2,996	$31,012	*
.0016	4,790	Light	.0200	2,000	600	200	200	1,790	†
.0030	8,600	Heat	.0358	3,000	1,000	300	300	4,000	
.0073	21,000	Building Service	.0875	8,000	2,500	700	800	9,000	
$0.0380	$109,520	Total Rent, Light, Heat and Building Service	$0.4563	$42,075	$13,475	$3,872	$4,296	$45,802	
	4,000	Taxes		1,460	300	500	140	1,400	$ 200
	1,400	Insurance		500	100	200	50	500	50
		Depreciation							
	3,800	Water		2,300	400	100	100	850	50
	6,396	Steam		5,000	900		400	96	
	5,995	Power, Electric	29.975	3,800	700	900	250	345	
		Refrigeration (Charged Monthly on Basis of Consumption)							
	3,621	Garage Rent and Heat							3,621
	5,750	Telephone and Telegraph		400	260	20	20	5,000	50
	$140,482	Total		$55,535	$16,135	$5,592	$5,256	$53,993	$3,971

* Garage rent below. † Garage heat below.

FORM 1.

partments according to the investment in land for each. A recapitulation by factors was given in summary form at the bottom. Whenever actual prices during the budget period did not conform to the estimates, the budget figures were changed in order that the monthly charges to the departments, based on the budget, would absorb the actual expenses during the year.

It will be noted that in the recapitulation at the bottom of Form 1 the total amounts given for rent, light, and so forth, include the amounts distributed to producing departments only; charges to service departments are excluded in a manner to avoid duplication. Thus, the amount for rent in the recapitulation is $75,130; in the form above the amount is $82,500; the difference is the $4,690 in power, $43 in telephone service, and $2,637 in garage. The total of all expenses, in the main form and in the recapitulation, is $140,182.

It had been argued that the estimates should be made sufficiently large so that changed conditions would not necessitate altering the budget figures. Such a procedure, however, probably would result in an overabsorption which would have to be charged off at the end of the year and that would be as objectionable as the underabsorption or overabsorption which resulted from the existing budget plan. The budget in use required much time and expense for its compilation, and according to several of the executives it served no essential purpose, because equitable charges to departments could be derived by averaging the charges of previous years. Such charges, however, would be more in the nature of normal costs than actual costs, or estimates of actual costs, and manufactured goods should be charged as far as possible with the actual expenses incurred for them. The existing budget, furthermore, did not provide sufficient control over the manufacturing processes.

Should the Lang Chemical Company have continued to use its budget system?

6. Elkhart Manufacturing Company

BUDGET CONSTRUCTION: HOW DETAILED SHOULD A BUDGET BE WHERE THERE ARE 25 SUBSIDIARY COMPANIES INVOLVED?

The home office of the Elkhart Manufacturing Company, located in New York City, set up a budget at the beginning of each year for the 25 operating companies it controlled. The estimated total sales were computed in the light of past experience and upon expectation of what the future would bring forth; then this total figure was broken down into estimated sales figures for each plant. The cost of sales was then established by predetermining what the costs to manufacture would be with sales at the budget figure, and establishing a figure for final inventory; the beginning inventory of finished goods was taken from the last profit and loss statement where it was listed as a final inventory. The cost of goods manufactured figure was then broken down into its component parts of beginning and ending inventories of raw materials, purchases, beginning and ending inventories of goods in process, labor, and expenses. The cost of sales figures and the cost of goods manufactured figures were then broken down and the various amounts were allocated to the 25 different plants in a manner dictated by experience. The budget was then completed by setting up in detail the predetermined costs of selling, administration, and financing which were broken down into amounts for each plant.

This type of budget had been successfully used for a number of years, but the question arose as to whether it was as effective as it might be. Although the master budget was worked out in complete detail in the home office, so that every item was shown with its budgeted amount, only totals for the various main divisions of the budget were included in the copies which were sent to the various plants; these copies contained amounts for sales, cost of sales, cost of manufacture, selling, administrative, and financial expenses; if an individual plant wanted the detail of the above items it had to compute the amounts. It was possible for one or more important items in the budget reports drawn up for an individual plant to be considerably over the budgeted amounts and the home office not be aware of it, because several other items, not so important perhaps, might be under the budget; so far as the totals were concerned, however, the plant would appear to be doing very well. It was suggested that to make the plant budgets really effective the home office in breaking down the master budget for each plant should break it down in detail and not by totals alone, and should arrange for budget reports on the same basis.

The objection to this possibility was that it would involve considerably more work and the results would not pay for themselves because in making up the budget the home office always established the various totals on the lowest possible figure for the volume expected, which meant that the individual plants could only offset losses on some items with gains on others to a moderate extent. Further than that, all variances from budgets were charged or credited to each plant's profit and loss account in the home office, which fact tended to hold each plant down to the most efficient basis which was usually the budget basis. So far as the individual plants were concerned a detailed budget would have been a help because it would have given each plant manager an exact idea of how the home office established the totals; under the present budget plan the best he could do was more or less to guess at the relative proportions of the various items that comprised the total.

Should the budget for individual plants be drawn up in detail?

What advantage does a budget have which would be better served by a detailed budget?

D. COSTS RELATED TO GENERAL ACCOUNTING

1. Waldron Paper Company—No. 8

COST SHEETS: HOW ARE THE HALF STUFF, FURNISH COST, AND LOT COST SHEETS USED?

In the February production of paper in the Waldron Paper Company were included Bleach Orders Nos. 721 and 722, Beater Order No. 257, and Lot Nos. 2520 to 2524, inclusive. Information pertaining to the Bleach orders was contained in Half Stuff

Cost sheets, information relative to Beater Orders was contained in Furnish Cost sheets, and information pertaining to lot numbers given in Lot Cost sheets.

HALF STUFF COST SHEET

Cost data relative to Bleach Orders Nos. 721 and 722 are given in Form 19.

A Washer Report gave the following information relative to time spent on the two bleaches.

WASHERS

Bleach No.	No.	Time On	Time Off	Total Hours
721	1	12 MN	9 AM	9
722	2	12½ AM	9¾ AM	9¼
721	3	12¼ AM	9 AM	8¾
722	4	12 MN	8¾ AM	8¾
722	5	1 AM	10¼ AM	9¼
721	6	1 AM	10¾ AM	9¾
721	1	9¾ AM	6¾ PM	9
721	2	10¼ AM	6¼ PM	8
				71¾
721	3	9½ AM	6 PM	8½
722	4	9¼ AM	6¼ PM	9
722	5	11 AM	8 PM	9
722	6	11¼ AM	8 PM	8¾
				35¼

The burden rates for the various departments were given in Waldron Paper Company—No. 7. The Raw Stock Handling and the Rag Preparation rates were applied against the total "Baled" weight.

The "bone-dry" weight of the two Bleach orders as given to the drainers showed upon the Beater reports as 7,980 pounds for No. 721 and 8,170 pounds for No. 722. These amounts allowed for the average shrinkage factor and were used in applying the Drainers and Stock Digging burden rate. The amounts of bleach and alum used in the washing were shown in gallons on the Washer Report. These figures were multiplied by the

RAG ROOM REPORT

Time Sheet Date

Number	Employee Name	Grade Bleach No. 721				Grade Bleach No. 722				Total			
		Hrs.	Lbs.	Rate	Cost	Hrs.	Lbs.	Rate	Cost	Hrs.	Lbs.	Rate	Cost
1	Berardi......	8		.40	3.20								
2	Morgan......	4		.42	1.68	4		.42	1.68				
3	Joslyn.......	8		.40	3.20								
4	Prince.......					8		.40	3.20				
5	Stabilsky....					8		.40	3.20				
6	etc.												
7													
8	All Others...	160		.41	65.60	166		.41	68.06				
9													
10													
11													
12													
13													
14													
	Total	180			73.68				76.14				
	Soda Ash....				1.90				1.75				
	Lime........												

Waldron Paper Co. No. 8

Form 19.—Front.

average cost per gallon, which gave a charge for Bleach Order No. 721 of $2.75 and Bleach Order No. 722 of $3.10.

Make up Half Stuff Cost sheets for Bleach Orders Nos. 721 and 722.

FURNISH COST SHEET

The Beater Report (Form 20) and additional information given can be used to make up the Furnish Cost Sheet for Beater Order No. 257. The data for item "Loss of Weight Over Machine" shown on the Furnish Cost Sheet in Waldron Paper Company—No. 4 are omitted here to simplify the work.

Each car had a weight which was equivalent to 190 pounds of bone-dry stock. This weight was used for all car weight computations.

RAG ROOM REPORT

Stock Used Grade

Name	Date of Inventory	Number Bales	Grade	Weight	Bleach No.	Price	Amount
Lot No. 525		9		4226	722	.05	211.30
1026 etc.		14		5430	722	.055	298.65
Total				9656			
No. 1 Grade							
No. 2 Grade				97*	722	.07	6.79
No. 3 Grade							
No. 4 Grade							
Special							
Sacking				215*	722	.015	3.23
Muss							
Dust				286*	722		
Woolens				110*	722	.08	8.80
Total				708			

Name	Date of Inventory	Number Bales	Grade	Weight	Bleach No.	Price	Amount
Lot No. 238		8		5543	721	.10	554.30
938		9		2710	721	.10	271.00
1002		3		1052	721	.095	99.94
Total				9305			
No. 1 Grade				40*	721	.05	2.00
No. 2 Grade							
No. 3 Grade							
No. 4 Grade							
Special							
Sacking				155*	721	.015	2.33
Muss							
Dust				103*	721		
Woolens				54*	721	.08	4.32
Total				352			

Waldron Paper Co. No. 8

* These items were taken out of the rags to be used in the process of sorting. They were not a part of the cost of the Half Stuff and hence were credited on the Half Stuff Cost sheets.

Form 19.—Back.

Paper Machine No. 1 was down for 3 hours for wash-up after Lot No. 2524 was run. The burden rate for this operation was given in Waldron Paper Company—No. 7. This burden was the only amount for the paper machine process which appeared on the Furnish Cost sheets.

The amount of color, filler, and other chemicals used was multiplied by the unit cost as shown on the Inventory cards and a total of $68.80 and 1,705 pounds was obtained, including the cost of glue sizing, 1,175 pounds of this total being for filler which was added into the total beater weight opposite the heading "Filler" on the Furnish Cost sheets; the remainder of the 1,705 pounds was not added in.

BEATER REPORT

Grade Date Started 12/12 1925 Lots Nos. 2520 To 2524 Inc.

Beater Order No. 257 Date Finished 12/13 1925 Machine No. 1

Beaters No.

Furnish		Cars	Drainers	Cars	Drainers	Cars	Drainers	Cars	Drainers	Cars	Drainers	Cars	Drainers
Rags:													
No. 2 Cottons	.095 per pound	22		23		22		23		23			
Sulphite Pulp:	.06	21		22		21		22		22			
Soda Pulp:													
Shavings:													
Already Processed	.041	6		7		6		7		7			
Color:													
Filler													
Starch													
Glue													
Alum													
Rosin Size pails		90		95		90		95		95			
Tour:													
Furnished													
Emptied													
Time													
Red													
Green													
Blue													

Remarks

Waldron PaPer Co. No. 8

FORM 20.

The Raw Stock Handled and Stored amounted to 21,695 pounds which carried a burden rate of $0.20 per 100 pounds. The 21,695 pounds was not added into the "Beater Weight" on the Furnish Cost Sheet.

The Machine Report for Machine No. 1 showed the following which were entered on the back of the Furnish Cost Sheet:

Lot Number	Hours Run	Pounds Made
2520	2	2,486
2521	11½	22,420
2522	3¼	5,026
2523	3	5,013
2524	5½	10,465
		Total 45,410

The above amounts were corrected by adding 2% to the weight of each lot, which represented the amount of machine "broke" not used up in the beaters during the run. These corrected figures are given below and are used to find the Furnish Cost for each of the Lot Cost sheets which follow.

Lot No.	Weight
2520	2,536
2521	22,868
2522	5,127
2523	5,113
2524	10,674
	Total 46,318

The total corrected weight of 46,318 pounds was divided into the total cost shown on the Furnish Cost Sheet to find the cost per pound of the furnish.

Prepare the Furnish Cost Sheet.

LOT COST SHEETS

Make up Lot Cost sheets for Lot Nos. 2520 and 2524 from the following information. On the Lot Cost sheets, both the hourly and the poundage rates for the paper machine are to be used. The hourly rate was applied to hours consumed in producing paper, excluding any preliminary running or wash-up time. The poundage rate was applied to the corrected weight as determined on the Furnish Cost Sheet. The amount of Top Size used was determined by applying a rate of 1/30 of a pound of size to a pound of corrected weight paper. The rate per pound for Top Size was $0.11 and the rate for Size Making was $0.02 per pound. The price per pound of Mediums, Brokens, Shavings, and Broke was $0.08, $0.018, and $0.03, respectively.

LOT 2520

Lot 2520 went through the following finishing operations: Plating, Sorting and Counting, Trimming, Wrapping and Sealing, and Finished Storage and Shipping. The rates for the various departments are given in Waldron Paper Company—No. 7. The No. 1 Machine, the Trimming, and the Wrapping and Sealing operations each took two hours.

The Plating Department and the Sorting Department labor charges amounted to $7.24 and $11.32, respectively. The Finished Stock and Shipping Department handled 2,197 pounds of stock or perfects. The Mediums, Brokens, Finishing Room Shavings, and Machine Broke amounted to 46, 21, 222, and 50 pounds, respectively.

LOT 2524

This lot went through the Calendering, Sorting and Counting, Trimming, Wrapping and Sealing, and the Finished Storage and Shipping Finishing Departments. The paper machine operation took 5½ hours and the Trimming and Wrapping and Sealing Departments took 6½ hours each. The Finishing Storage and Shipping Departments handled 9,335 pounds of stock or perfects. The Mediums, Brokens, Finishing Room Shavings, and Machine Broke amounted to 203, 96, 831, and 209 pounds, respectively. The Calendering Department and the Sorting Department labor charges were $3.44 and $44.20.

2. WILLOW FLOUR MILLS COMPANY

SUBSIDIARY BAG FACTORY: HOW SHOULD A SUBSIDIARY BAG FACTORY BE CONTROLLED?

The Willow Flour Mills Company operated a factory in which it manufactured large quantities of cloth and paper bags, printed with its name and trade-mark design. The bag factory was treated as a separate manufacturing unit, with its own set of accounts, controlled from the General Ledger. Completed bags were turned over to the flour mill at prices for which similar bags could be bought in the market.

The bag factory balance sheet was as follows on January 1:

ASSETS	
Raw Materials	$ 6,000
Work in Process—General	5,000
Work in Process—Printing	900
Printing Plates	800
Machinery and Equipment	40,000
	$52,700
LIABILITIES	
Accrued Liabilities	$ 1,500
Allowance for Maintenance	300
Allowance for Depreciation	3,400
General Ledger—Current Investment	10,400
General Ledger—Liabilities	
General Ledger—Profit and Loss	
General Ledger—Fixed Investment	37,100
	$52,700

The last four accounts in the "Liability" section indicated the character of the accounting control for the bag factory; in the General ledger there were four corresponding accounts with debit balances. The purpose of this form of control was to provide in the General Ledger a proper subdivision between fixed assets and current liabilities; since the bag factory was only one of several subsidiary factories of the Willow Flour Mills Company, the total investment in them was considerable. Unlike many companies where there was only one manufacturing plant, the management desired in this case to treat each plant as a completely segregated operating unit; for this reason all the Fixed

Asset accounts for the bag plant were included in the Bag Factory Ledger, as well as the Inventory and Operating accounts.

The account "General Ledger—Current Investment" was the control for the bag factory's current assets; it was, however, used only for balance-sheet purposes at the end of the year, when the accounts "General Ledger—Liabilities" and "General Ledger—Profit and Loss" were both closed into it. The account "General Ledger—Liabilities" was credited currently with all expenditures made by the central office for operations of the bag factory; it corresponded to the Accounts Payable of the ordinary independent plant. Sales from the bag factory to the milling departments were debited to this account; at the end of the year the balance of the account was transferred to General Ledger—Current Investment.

The account "General Ledger—Profit and Loss" showed the profit of the bag factory at the end of each year, after which it also was transferred to General Ledger—Current Investment.

General Ledger—Fixed Investment was the control for the bag factory's fixed assets; whenever any additions were made to the plant this account was credited.

The account entitled "Allowance for Maintenance" was credited monthly with a fixed amount, being one-twelfth of the estimated annual expense for maintenance; the corresponding debit was to Maintenance Expense account.

The method of operating this control can best be demonstrated by a brief example, based on a survey of the transactions for the year; for this purpose the following data are given:

(*a*) During the year, the central office, by means of debit memoranda, charged disbursements for the following amounts to the bag factory: Raw Materials, $28,000; Printing Plates, $400; Maintenance, $750; Labor—Direct, $30,000; Supervision, $4,000; Rent, $1,200; Interest, Insurance, and Taxes, $1,600; Storage Costs, $900; Power, $1,400; Labor—Indirect, $3,000; Unloading, $2,000; Burlap and Twine, $300; Supplies, $400.

(*b*) The Accrued Liabilities were also paid by the central office.

(*c*) It was the custom to charge Operations with one-fourth of the balance in Printing Plates account at the end of the year, for the reason that they last four years upon the average.

(*d*) Provision for Depreciation was determined to be $800; and provision for Maintenance, $950.

(*e*) Insurance and Taxes accrued at the end of the period, $400.

(*f*) The Overhead Expenses were allocated, $6,740 to Printing Overhead, and $10,510 to General Overhead.

(*g*) Of the Direct Labor, $12,000 was charged to the Printing Department, and $18,000 to the General Manufacturing account. On these amounts, the respective prorated overhead charged to the product totaled $6,200 and $9,700.

(*h*) Raw materials requisitioned, chargeable to the General Manufacturing account, amounted to $26,000.

(*i*) Printed Stock transferred to General Manufacturing, $18,500.

(*j*) Sales for the period, $74,800; Cost of Goods Sold, $69,700.

On a Working sheet, provide "Debit" and "Credit" columns for the original balance sheet as of January 1, another pair of columns for the transactions given, and a third pair for the balance sheet as of the succeeding January. Enter the above data, and work through to the final balance sheet.

Give a statement explaining precisely what has occasioned the change in the Current Investment Control account between the beginning and the end of the year.

3. BRETTLE LANE CEMENT COMPANY

GENERAL AND COST LEDGERS: HOW SHOULD THE GENERAL LEDGER AND COST LEDGER BE USED TO CONTROL ITEMS OF COST?

The Brettle Lane Cement Company, located on the Atlantic seaboard, owned the land and buildings in which it manufactured portland cement by the "dry process." It also owned an adjacent quarry from which one of its principal raw materials, limestone, was obtained. The other principal ingredient, blast furnace slag, was purchased from a neighboring iron works, and was delivered to the cement mill by rail, at a price "f.o.b. shipper's works," as were all other raw materials, with the exception of the limestone. The manufacturing operations of this company were divided into five main departments, namely: quarrying, raw material grinding, coal grinding, clinker burning and clinker grinding.

Quarrying operations were carried on by the use of drills, blasting materials, steam shovels and a light railway for hauling the rock. There was also a stone crusher located in the quarry which effected a preliminary breaking up of the rock. Some of the bulk materials produced by this crusher were used for road building, while the finer-sized rock was carried to the cement mill or to storage. It was considered advantageous to eliminate these bulky materials from the cement manufacturing as the remainder required far less grinding in the mill.

The second department, that for raw material grinding, contained two separate units, one for grinding the limestone and one for grinding the blast furnace slag. After a preliminary grinding, the two materials were thoroughly dried and pulverized in another mill which prepared them for the burning process. Throughout this stage of the manufacturing process, it was essential that chemical tests be made hourly of the ingredients in order that the right mix would be insured.

Coal grinding by itself constituted a separate department. The coal was taken from storage, pulverized, and fed to the kiln where the burning process took place. The care with which this fuel was prepared had considerable effect upon both the manufacturing costs and the quality of cement produced. It was estimated that the cost of this operation was 5 to 10 cents per barrel of finished cement. This high cost, however, was in part offset by the fact that a poorer grade of coal, if pulverized, would give better results than a coarser treatment of higher-priced fuel. Properly pulverized coal also gave more uniform results in the burning process.

The company had four kilns, all of which were equipped with the necessary elevators, platforms, and feeders, in which the burning of the cement mixture took place at a temperature of about 2800° F. These kilns were the most expensive items of the plant equipment and had to be relined frequently at a considerable cost. When the mixture entering the kiln came in contact with a jet of flame some 30 or 40 feet in length, about one-third of its weight was lost in the form of gas, and clinkers were formed which fell into a cooling cylinder below where their temperature was slowly reduced. At this point certain ingredients were added to control the chemical reactions in order to keep the properties of the clinker within specified limits.

These clinkers, when taken from the cooling cylinder, passed on to the clinker grinding room, where they were ground to a standard fineness which required that 78% of the mixture pass through a 200-mesh screen, i.e., one having 40,000 holes per square inch. On account of the standard requirements and the hardness of the clinkers, this grinding process was carried through three different mills, each one pulverizing the clinker to a finer state. Gypsum had to be added in this operation to control the set of the final product, which came from this department and went into storage.

As cement improved in quality, if properly stored, and as the selling period for cement was highly seasonal, this company had storage bins of 5,000,000 cubic feet capacity. Such a large space was necessary because it was customary to sell cement from a sample of that in storage, the price being quoted per barrel of 376 pounds "net f.o.b. plant." The cement, however, was actually packed in 94-pound bags, four bags being considered a barrel. Furthermore, this large storage space was essential, for this company produced, as far as possible, throughout the entire year in order to take advantage of the lower cost resulting from continuous production.

At one time the company had to meet severe competition, from both domestic and Belgian cement. The latter could be sold very cheaply at ports in this country, because of favorable ocean freight rates occasioned by the use of cement as ballast in the empty bottoms returning from Europe. Under such circumstances the executives of the Brettle Lane Cement Company realized the necessity of having perfect cost control and proceeded to examine their costing system to see if it were accurate, and to see if the data collected were presented in the most serviceable manner. Before undertaking the study they agreed that not only departmental costs should be collected, but that the various items of expense within a department were of sufficient importance to be shown separately.

For purposes of control the Brettle Lane Company operated a Cost Ledger concurrently with the General Ledger, the Cost Ledger being used as a Departmental Ledger. In general the accounting system was built about the five manufacturing divisions previously mentioned. For example, in the quarrying of limestone all Costs of Labor, Supplies, and Expenses for Departmental Overhead, plus a proportionate share of General Overhead, were charged to a Quarrying account. These charges were subdivided into Direct Operating Labor, Direct Operating Supplies, Repairs, Depletion, General Overhead, etc., and closed monthly into the controlling accounts. After credit was given for the bulk materials sold for road building, the inventory account, Limestone, was charged with the balance of the Quarrying account. This inventory was set up instead of transferring the limestone directly to the next process, because it often happened that quarrying operations which lasted only a few months would provide sufficient raw material for a year. This inventory account was credited each month with limestone that went into process.

Raw Grinding was charged with the limestone used and, as in the quarrying department, costs of operating the grinding process were accumulated through subdivisions of types of cost. The costs of the department grinding coal were accumulated in the same fashion. Inasmuch as the process was continuous, each of these accounts, Raw Grinding and Coal Grinding, was credited with its debit balance at the end of each month and a corresponding debit made to Clinker Burning.

Clinker Burning was similarly treated, but there was an inventory account set up for Clinker. This was necessary for the same reasons that an inventory account for Limestone was used, i.e., because occasionally more clinker was burnt than could be ground within a month. Thus, the Clinker account was credited and Clinker Grinding debited for all clinkers going into the grinding process. Departmental costs were accumulated here as well, and Cement debited with the total cost. The Cement account was credited with cement sold as indicated on the shipping records; therefore, the inventory was always known and its cost could be figured readily. A physical inventory would only approximate this record, because the loss of space in stocking the pile of cement did not permit an accurate estimate to be made.

In examining this accounting system, the executives considered the use of standard costs. Although they made no decision concerning their use at the time, it was felt that the use of standard charges might facilitate the accounting system, and also afford more accurate records. It appeared to them that the company's operations were such that standard costs might be used to advantage. Raw material prices were, relatively speaking, constant; labor costs equally so; whereas burden was a constant charge within fairly determinable limits, and production was usually continuous throughout the entire year.

What accounts would you consider necessary to have in the General Ledger; and what in the Cost Ledger?

How would transfers from one ledger to the other take place? Give examples of such transfers?

Would this situation be suitable for the introduction of standard costs? If such a system were introduced, what effect would it have upon the structure of the General and Cost Ledgers?

4. Blaine Electrical Company

MANUFACTURING ACCOUNTS: ARE DEPARTMENTAL ACCOUNTS NECESSARY FOR ADEQUATE RECORD AND CONTROL OF WORK IN PROGRESS?

The Blaine Electrical Company was one of the larger manufacturing companies of the country. Considerable discussion took place from time to time among production officials and the works accountants as to the advisability of having one single consolidated account for work in progress in the entire plant, or of having a separate account for each manufacturing department.

Approximately 25 separate Work in Progress accounts had been carried, and a Committee had been appointed to outline the new routine which would have to be followed when these separate accounts were merged into one. The Committee took the liberty of discussing, however, the wisdom of such a move, and the following were the various arguments for and against which developed in that discussion. The consolidation went through, but, after operating for about two years, it was finally deemed best to return to departmental accounts, as they were found to be of assistance in assembling costs on parts and completed products.

SUMMARY OF REPORT OF COMMITTEE ON CONSOLIDATION OF DEPARTMENTAL WORK IN PROGRESS ACCOUNTS

Theoretical Advantages of Consolidation

1. It was felt that too much of the effort of the Works accounting department was devoted to billing of individual deliveries between departments and that under a consolidated account this billing could be eliminated and the effort be devoted to more constructive work, such as cost revisions, etc.

2. The annual inventory adjustments affecting the departmental Work in Progress accounts were often so large as to throw considerable doubt on the accuracy of the monthly figures showing these investments.

Theoretical Disadvantages of Consolidation

1. The eliminating of interdepartmental billings would necessitate the setting up of some other channel through which cost data from feeder sections could be transferred to assembly sections and so place the latter in a position to intelligently work up complete costs of assembly apparatus. This latter routine promised to be nearly as burdensome as the interdepartmental billing and rather less dependable.

2. Unusual increases or decreases in the investment of an individual department often indicated weaknesses in our costing procedure and prompted investigation and improvement long before the end of the inventory year.

3. While inaccurate costs and irregularities in bookkeeping features surrounding the operation of departmental investments sometimes carried a certain element of error into the investment figures, the maintenance of these segregated departmental investments seemed to have a distinct moral effect on the superintendents in the control of materials withdrawn from main stores and in the pressing of work on to completion in order that credits might be secured through apparatus deliveries.

4. The desire on the part of the cost men to avoid heavy inventory adjustments promised much greater care on their part under the departmental plan, since these inventory adjustments were usually considered as reflections on the cost work. Under the consolidated plan, the inventory adjustment on an investment running from ten to twelve million dollars could no longer be traced to the responsibility of an individual department and, accordingly, relieved the cost men of the feeling of personal responsibility, which existed previously.

5. The maintaining of segregated investments made available, through the monthly billing figures, data giving the monthly volume of production of each department.

Why was it necessary to return to the departmental Work in Progress accounts?

5. Jackson and Carter Cannery

SPECIAL RESERVES: HOW SHOULD IRREGULARITIES IN PRODUCTION RESULTING FROM CROP FLUCTUATIONS BE TREATED?

Jackson and Carter Company operated a small cannery in which they packed, in several grades, a variety of vegetables which they purchased locally. It was the customary policy of the company to purchase vegetables directly from the farmers in bulk at a single price which was usually determined by contract. Sometimes purchases were made upon a sliding scale system, the price depending upon the quality and the market price at the time of delivery. At no time, however, was it possible to tell what grades or how much of any one grade would arrive at the plant. It was not until the goods had been received, graded, and those not suitable for canning had been rejected and returned, that the exact amount available for production could be ascertained.

As a result of the dependence of this cannery upon the locality for its vegetables, production varied greatly from year to year, not only in respect to the quantity of any one vegetable or grade canned, but for production as a whole. In years of a high crop yield, production was large; on a low crop yield, it was small. Because of the fact that the products of this company were branded and that the price for canned goods depended upon the supply from other districts as well, the high overhead charges per unit caused by a year of low production could not be recovered by raising the price. The situation was so acute that it often materially affected profits and in some years had caused a considerable loss. These annual fluctuations in profits troubled the partners greatly, as did the fact that they never knew how much overhead to charge to a single grade in any given year. Consequently, they sought advice from a trade association to which they belonged.

The trade association recommended that this cannery follow a plan for equalizing profits that was quite common throughout the industry, namely, set up a reserve to care for excessive overhead charges. In years of more than normal production, reserves might be set aside to care for the overhead costs in subnormal years. For example, in years that the actual pack equaled the normal pack, no charge need be made, but if the actual pack was greater than the normal, a reserve should be set aside to be used to reduce, to a normal amount, the overhead chargeable to production in a subnormal year.

This plan appealed to the executives, for it offered a solution to some of their problems. Yet they were somewhat in doubt whether or not it would be sound accounting and did not know how extensively they should use the plan.

Is this plan sound accounting? If so, how should the normal be determined?

Would it be of advantage to find a normal and set up a reserve for each kind of vegetable packed? Each grade?

E. CONTENT AND PRESENTATION OF EXECUTIVE REPORTS

1. Eastern Rubber Company

STATISTICS AND CHARTS: DOES A STATISTICAL AND CHART PRESENTATION OF FACTS HAVE ANY ADVANTAGE OVER CUSTOMARY COST REPORTS?

In 1923 the Eastern Rubber Company decided that some action should be taken to obtain a clearer picture of what was happening to its business and its costs. During the war and post-war periods the executives were all aware that violent fluctuations were taking place, but it was difficult to get a clear picture of the situation from the annual statements presented by the accounting department. The difficulty with the accounting presentation of facts was that the fiscal year was used as the base, whereas the changes which were occurring were not confined within a single year but were assuming large proportions when accumulated for a number of years. Consequently, several of the executives inquired of the accountant whether he could arrange to organize his facts in such a way as to enable them to get a better picture of these long-period movements.

The accountant was of the opinion that it would be unwise to place his recording of facts upon any other basis than the fiscal year, but he thought the facts thus recorded could be correlated in such a way that the executives might get the results they desired. To accomplish this end the accountant engaged two new men who had had considerable statistical experience and who were clever at presenting data in chart form. These two men were assigned to the task of gathering significant facts relative to costs of operation and volume of business from year to year and presenting them in such fashion that the executives could see at a glance what the trends were and what the general condition of the business was at a particular moment of time.

The new statistical men began to gather cost data, production data, and data on volume of business which they decided could be best presented in graph form. At the end of each year they also presented both by bar and line charts all the data contained in the balance sheet. This work continued for several years and apparently it was working successfully.

In the early part of 1928 a question arose relative to certain production data; the accountant was not quite clear why the executives should be raising the question when the particular information they were seeking had been presented to them in a chart. After gathering the data necessary to discuss the question, the accountant entered the office of the executive who was interested. During the discussion the accountant observed that a considerable number of charts were piled up on one corner of the executive's desk and, after the discussion, asked if the executive had referred to the charts or made any use of them. The reply was that the executive had glanced them over, but when it came to the solution of specific problems he wanted figures.

The statistical work had been costing approximately $10,000 a year, which the accountant felt was a considerable expenditure to produce material if it was not used. The charts and statistics could be gathered at any time from the statements and books of accounts. This being the case, and the fact that some executives in the last analysis did not make much use of the graphs, led the accountant to consider abandoning the statistical work; those executives who desired the charts could draw them up from the statement presented to them by the cost department.

Do you think the statistical work done by the accounting department should have been abandoned?

What relationship exists between statistics and accounting?

To what extent might graphs and charts be valuable in accounting presentation of data?

2. Waldron Paper Company—No. 9

EXECUTIVE PROBLEMS: WHAT ACCOUNTING PROBLEMS ARISE FOR EXECUTIVE CONSIDERATION IN THE PAPER BUSINESS?

Although the Waldron Paper Company had been operating its cost accounting system for a long time, certain questions of policy continually were arising. These problems are discussed in the paragraphs below under the following titles: 1. Executive Considerations; 2. Methods of Costing; 3. Material Costing; 4. Labor Costing; and 5. Burden Costing.

1. EXECUTIVE CONSIDERATIONS

The executives wanted to receive enough reports containing information about the various departments to give them a good insight into the status of production; on the other hand, they were aware that the matter of requiring reports could go to such an extreme that the cost of gathering the data would exceed the value received from the additional information. Moreover, there was the danger that so many reports might be made up and submitted to the executives that they would know very little about the actual status of production because they would get lost in the detail. Amid these considerations, the executives of the Waldron Paper Company were always faced with the problem of finding the happy medium or the number of reports they should receive.

2. METHODS OF COSTING

The company had considered the two principal methods of gathering costs, namely, the job cost method, and the process cost method. In so far as the specialties which the company produced were concerned, there was not so much question, since practically everyone agreed that the job cost method was best. In the case of the regular runs there was very little agreement.

The question of which method the company should use was constantly arising. It was pointed out that several companies making carton and cartridge paper used process costs entirely, chiefly because once the raw material was started in process, it flowed through a continuous sequence of operations until it was transformed into the finished product. Again, the Committee on Cost of Cover Paper Manufacturers' Association in its report of 1918 recommended the job method because in that branch of the paper industry there were many changes caused by short runs. The committee claimed that the summarizing of the individual lot records, according to grades or other classifications, was a good method of obtaining comparative information of high value. Still another view was presented. A certain paper company, which was very progressive in its cost accounting procedure, used a process method of costing, together with a standard cost system. Occasionally it kept track of the cost of a run in case of its standard grades. It always ascertained the actual cost in case of special runs or new grades of paper.

3. MATERIAL COSTING

In the case of material, it was difficult to determine the amount of material used as it passed through the various processes, on account of the variation in the amount of moisture content of the different grades and lots. In the majority of paper companies raw materials were either weighed, counted, or measured at the time of use, and a record of the quantity was made. In other cases, the weight and moisture percentage, when received, was used to determine the weight as used, regardless of the loss in percentage of moisture during storage.

The company in many instances prepared material before it was started through the various processes, which made the ascertainment of dry weight even more difficult. In some mills dry weight was being closely determined through exhaustive tests to ascertain moisture content, and in conjunction with these tests, a continuous record of weight of material when used was kept. In other mills, satisfactory results were obtained by keeping records of the number of dump cars obtained from a given quantity of raw material and establishing a value per car. Then there was a third group in which the percentage of moisture content estimated by the mill superintendent was used in charging materials. While over a long period of time such a method was found to give a close check with materials actually used, it had proved, in many instances, very inaccurate for individual runs.

The question of what material was to be treated as "direct" and what material was to be treated as "indirect" was an ever-present one. The rags, half stuff, pulp, and paper were clearly direct materials. The case was not so clearly defined when bleaching liquor, filler, sizing, color, or other chemicals were involved. In practically all cases where the latter materials were used, they were measured to insure proper proportions, and records were kept of them in many cases. The question arising, however, was whether the added accuracy obtained by using these records was worth the time and trouble. In the case of color and rosin, for instance, less than one-half of 1% of the total cost was involved. In the case of certain other chemicals, no more than three-fourths of 1% of the total cost was involved. In the case of tub sizing, which was applied in the middle of the paper-machine operation, it was very difficult to tell how much each lot of paper had absorbed. The furnish weight could not be subtracted from the final weight to find the amount of sizing absorbed, even if exact allowances were made for moisture content, because of the large losses in weight due to invisible waste and "broke," both of which varied with the grades of paper, and the latter depended somewhat on the efficiency of the machine crew. Yet this raw material added over 3% to the weight of the paper on the average.

Besides the above problems, there were some supplies, such as felts and wires for the paper machines, that amounted to a large sum, and which wore out frequently. Should these be charged directly to the product or indirectly by being included in burden? Then, there were the shipping cases made from lumber in the company's box department. Should the company continue to manufacture its own boxes or should it buy them from box making companies?

One of the most important problems involved in costing material was that of recording "broke," which was the technical name for visible waste in the paper industry. Some of this waste was thrown into the beater during the same run, but a great deal of it was held and put into other runs. The quantities of "broke" varied with the runs and grades of paper and were weighed by lots of paper produced. It was apparent that each kind of paper should be charged with the "broke" it caused where there was any variation in the grade. It seemed that some allowance should be made for the fact that the shorter the run the less the percentage of the "broke" that was put back into the beaters to come through on that run. On the other hand, some runs used less furnish materials because of the "broke" used from previous runs. If it was decided to charge the following runs for "broke" of previous runs, there was still the question of getting a rate. Should the actual cost of the "broke" in so far as it could be ascertained be used, or should an approximate market value or some standard rate be used? If the latter was to be used, how was it to be computed? The same problems and questions were present in accounting for shavings and mediums.

4. LABOR COSTING

The major problem in accounting for labor was that of distinguishing between direct and indirect labor. Certain prominent accountants, in speaking of the paper industry, claimed that much of the labor in a paper mill was direct, but that no greater accuracy, as far as ultimate results were concerned, was gained by treating it as direct. They argued that in most cases the burden rate was calculated on the machine-hour basis, and as labor was also paid by the hour, the same results were obtained whether the labor was accounted for as direct or indirect. The detail involved was less by following the latter method. The problem was most acute in the finishing departments.

5. BURDEN COSTING

Several interesting problems continually recurred in the case of burden.

There was the problem of computing standard departmental rates; the mill had 15 direct producing centers and a standard rate had to be determined for each. In the case of the Raw Stock Handling and Storage and the Rag Preparation Centers there was not so much question, since the estimated number of pounds handled or processed was a sound and obvious basis for a rate. But in the case of the Washing Center, should a machine-hour rate have been used or should a rate based upon estimated pounds washed be used? In the case of size making, should the number of pails be the basis for a rate or should a labor-hour rate be computed? The same question arose about every one of the other direct producing departments.

Since the fixed assets were grouped into several accounts regardless of their location, the fixed charges (taxes, insurance, depreciation, and interest) were figured upon such totals. Yet part of these fixed assets were used for selling and administrative purposes; the question thus arose as to whether the company should divide the fixed charges amount into the sum applying to fixed assets being used in production and the fixed assets being used for selling and administrative purposes. If a distribution was made, the part of the fixed charges applying to assets used for selling and administrative purposes would go directly to Profit and Loss. The balance would be treated as manufacturing burden and be charged to Paper in Process. If no division was made, and the total amount of the fixed charges treated as manufacturing burden, the cost of paper manufactured would include a portion of selling and administrative expenses.

Then there was the problem of distributing the burden costs of the indirect producing centers to the direct producing centers; the difficulty encountered here was that of avoiding the "vicious circle." Some indirect center had to be distributed first; yet in most cases, after it had been distributed, certain charges should strictly go to that center from a later distribution of another center. For example, suppose that the Water Supply Charges were distributed first; later when the Building Expense Charges were distributed it was obvious that a portion of them might easily pertain to the Water Supply Center; yet this center had been closed. The question of how to secure a reasonable accuracy without too much work was an ever-present one.

How could the executives of the Waldron Paper Company determine a happy medium in the way of reports submitted to them?

Would it make any great difference whether the process or job cost method was used in the proper business?

How should the various material, labor, and burden problems be handled?

3. Danville Engineering Company

PRODUCTION REPORTS: HOW MAY COST REPORTS SUBMITTED TO A BRANCH FACTORY SUPERINTENDENT BE MADE EFFECTIVE?

The Danville Engineering Company owned manufacturing plants in various parts of the country, with general executive and administrative offices in New York; the officials at these headquarters were constantly seeking new methods of checking costs at the different plants, and of stimulating the interest of the plant executives in cost reduction, either on the present basis of manufacturing, or by means of revision of types and design of product, or of methods of production. The different plants were not all making the same product, and stood in varying relationships to the head office and to each other; consequently the same forms of manufacturing accounts and reports were not required of all plants alike, and new forms were tried out from time to time with one or more plants, without being used immediately for all of them. In the course of this policy, Form 1 was developed as a report on manufacturing costs and results, to be applied to the McRae Works, located in eastern Pennsylvania.

This report was designed at the head office, and was filled in at the plant, from data available, one copy being submitted to the plant superintendent, and a second being forwarded to the New York office. The main purpose of the form was to develop a gross difference between standard and actual costs, and then to and actual figures, and was used to summarize the data of difference. A sheet of notes (Form 2) accompanied the report itself, to throw further light on some of the variances between standard and actual figures and was used to summarize the data of different departments and to furnish the totals for Form 1.

Form 2 was new to the superintendent of the McRae plant, who was disposed to regard it as a somewhat academic affair,

OPERATING STATEMENT

	Jan.	Feb.	March	April	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.	Months Ending
Standard Cost													
Actual Cost													
Net Variance													
Analysis of Variance													
Due to Following Causes:													
Labor:													
Extra Operations and Allowances													
Expected Efficiency													
Rates of Pay													
Fixed Charges:													
Efficiency													
Idle Time													
Calendar Variation													
Rates													
Other:													
Repairs and Replacements													
Supplies Used													
Inspection													
Defective													
Miscellaneous													
Total Net Variance													

Form 1.

Danville Engineering Co.

				SUMMARY OF COST SHEETS			Month ending		
Department	Base Allowed Hours For Std. Mo.	Net Actual Allowed Hours	Ratio Net Actual Hours to Base	Std. Cost of Goods Produced in Month	Actual Cost of Months Operations	Total Variance	Labor		
							Extra Operns. and Allwns.	Expected Efficiency	Rate of Pay
Total									
	Fixed Charges				Repairs and Replacements Made	Supplies Used	Inspection	Defective Work	Miscellaneous
	Efficiency	Idle Time	Calendar Variation	Rates					
Total									

Danville Engineering Co.

FORM 2.

reflecting the theories of some official at the head office rather than any practical matters. The general executives were, however, not content to permit this attitude to continue, and proceeded to devise a bonus scheme by which an appreciable part of the plant superintendent's compensation was to consist of a premium contingent upon, and in proportion to, his efficiency in operating the plant, as disclosed in the report comparing standards and actuals. The superintendent's interest in this report was immediately awakened; he began investigating the causes of difference at the plant itself, and also wrote frequently to the head office to ascertain the precise significance of specific figures, and proposing various ways of improving the showing. Head office executives welcomed these approaches, and contributed any suggestions they could in connection with proposals advanced by the plant superintendent; it seemed evident to them that the superintendent had adopted a far more aggressive attitude in matters related to efficiency and cost reduction.

Was the adoption of the executive bonus plan a proper way of arousing the superintendent's interest in the reports?

Was his interest likely to be sustained?

4. Edge, Hill and Company

EXECUTIVES' REPORTS: WHAT KIND OF REPORTS TO EXECUTIVES WILL ENABLE THEM TO MAINTAIN ADEQUATE CONTROL OF OPERATIONS?

In connection with a reorganization of the management of Edge, Hill and Company, printers of greeting cards and similar art products, a new controller was brought into the concern to develop an adequate cost control and revise the accounting methods. He proceeded to install a system of standard costs throughout the plant and on that background developed the accounting procedure to be carried out.

Upon examining the reports rendered to the executives concerning operations of the plant, he found that they consisted chiefly of the following:

An annual report prepared by an accountant which included a Balance Sheet and Profit and Loss Statement as of the end of the year, together with schedules of purchases and operating expenses.

Current statistics as to volume of orders received in dollars, available monthly or oftener.

Current statistics as to volume of shipments in dollars available daily, weekly, or monthly.

Weekly reports prepared for the production manager showing output of various departments in commodity units.

Some statistics as to labor costs and some of the direct manufacturing expense, expressed as average costs per unit, or in percentage to sales value of output.

The experience of the controller in such matters led him to believe that these reports did not furnish sufficient information to allow the management to maintain an adequate control, and in their place he designed five statements to be furnished regularly to the officers of the company. He did not feel that these five reports were all that would necessarily be required, but believed that they formed a sound basis on which to build.

The first two of these reports were to be rendered monthly and were termed the Financial reports, consisting of the Balance Sheet and the Profit and Loss Statement. The Balance Sheet was of a standard form but the Profit and Loss Statement was made up in connection with the standard cost system, and showed, first, the trading profit realized on the basis of standard operating costs, and then the deductions or additions due to the operating variations, thus obtaining the actual trading profit. Other income and expense items were then added, giving total net profit for two periods, the current month and the year to date.

The other three statements were known as Operating reports, the first of which, called the Progress Statement, is shown in Form 1.

The importance of this form to the management depended upon two conditions associated with the business. One condition was that the production requirements taxed the capacity of the plant and required that some work be done outside, so that it was necessary that close adherence to the budgeted production be maintained, in order to keep costs at as low a level as possible. Closely connected with this condition was the fact

PROGRESS STATEMENT

Period Ending 19

	Current Period			Year to Date		
	This Period	Budget This Period	Same Period Last Year	This Year	Budget to Date This Year	To Date Last Year
Orders Received:						
Everyday						
Easter—Valentine						
Christmas						
Total						
Printing Orders Scheduled:						
Everyday						
Easter—Valentine						
Christmas						
Total						
Printing Orders Completed:						
Everyday						
Easter—Valentine						
Christmas						
Total						
Cards Boxed:						
Everyday						
Easter—Valentine						
Christmas						
Total						
Shipments:						
Everyday						
Easter—Valentine						
Christmas						
Total						

Edge, Hill and Co.

FORM 1.

that the success of the business depended to a large degree on being able to make shipments of seasonable goods on schedule, which required that manufacturing performance be kept up to date.

The Progress report showed, at five points throughout the

EFFICIENCY STATEMENT

Period Ending..........19..	Number of Machines or Normal Hand Force	A Maximum Possible Hours	B Actual Active Hours	B ÷ A Per Cent of Activity	C Actual Production in Standard Hours	C ÷ B Per Cent of Efficiency	PRODUCTIVE LABOR PAYROLL		
							Day Work Earnings	Premium Earnings	Per Cent of Premium to Day Work
Printing:									
Miehle									
Kelly									
Miller									
Hand Feed									
Bronzers									
Baker									
Die Stamping:									
Large									
Medium									
Small									
Hand									
Bordering									
Hand Coloring									
Finishing and Boxing									

FORM 2.

business, in dollars and cents of sales value, how the actual conditions were as compared with the budgeted performance. The executives were thus given a comprehensive check on operations at the principal division points throughout the business.

The second Operating report was the Efficiency Statement, shown in Form 2, on preceding page.

This statement served as a check on all the productive departments in the plant and immediately brought to notice any center in which poor results were being obtained. The last three columns were included to show what the results were from the incentive wage system that was in use, giving a comparison between the different departments.

The Cost and Variation Statement, Form 3, was made up as a summary showing the cause of the variations, from standard, of operating costs as divided into groups of expenses. Operating expenses included all costs incurred in regular production in the factory, with the exception of material which was handled separately, as shown. Outside work referred to jobs which other concerns did for the company. The actual costs, as accumulated, were entered in the first column, the amounts applied to product at standard rates in the second, and the difference of net variations in the third. From detailed records the net variations were analyzed under the five headings given.

In the first column the variations due to incorrect manufacturing estimates, or the use of different methods from those on which the standards had been set, were entered. As the business was distinctly seasonal and the different volumes of output would absorb more or less fixed overhead, variations because of this factor were entered in the next column.

The third variation factor, called "Production Efficiency," showed in dollars and cents value the profit or loss on labor and variable expense due to the actual rate of production in the shop, as compared with the standard. In the fourth column, "Amount of Labor and Variable Expense," were entered the variations in those cost items due to the different market rate which had to be paid and the standard. In the last variation column was entered the net variation on such items as General Manufacturing and other costs which had no direct relation to the volume of production.

COST AND VARIATION STATEMENT

Period Ending 19

	Actual Costs	Standard Estimate Costs Absorbed by Production	Net Costs Variations	Analysis of Net Variation According to Cause				
				Estimates and Methods	Volume of Output	Production Efficiency	Amount of Labor and Variable Expense	Amount of Fixed Expense
Operating:								
General Manufacturing Expense								
General Printing and Stamping.								
Printing Production...........								
Stamping Production..........								
Bordering....................								
Hand Coloring...............								
Finishing and Boxing..........								
Storage and Handling.........								
Filling Orders................								
Shipping....................								
Total Operating Variations...								
Outside Work:								
Outside Printing.............								
Outside Stamping.............								
Outside Offset................								
Total Outside Work Variations								
Materials:								
Paper......................								
Boxes......................								
Envelopes..................								
Ribbons and Sundries.........								
Total Material Variations....								
Grand Totals...........								

Edge, Hill and Co.

FORM 3.

Would the reports outlined by the controller give the management the information they should have about operations?

Should sales value or cost value have been used in making up the Progress Sheet?

How often should the different Operating reports have been rendered to the executives?

5. NEPAUL COMPANY

FOREMEN'S REPORTS: WHAT SHOULD BE THE CONTENT AND FORM OF REPORTS SUBMITTED TO FOREMEN?

The management of the Nepaul Company had established a complete budgetary control throughout their organization which was "tied in" with a system of standard costs based on scientific time studies which had been made of all operations. The budget for the factory was based on an estimated normal production which was measured in the different departments by suitable units associated with their output.

At the end of each four-week period, complete reports were made up for all departments of the concern. The productive departments in the plant were debited with the actual cost of production and credited with their output at the standard rate, measured in terms of the units mentioned above. The amount of the output was then compared with the normal as set for the department, and the activity of the center, expressed as a percentage of the normal, worked out. This percentage of the normal budgeted costs for a period was then credited to the department, and the difference between the amounts so obtained and the actual costs was considered as the operating variations.

At the end of each period, two reports showing the results of operations were furnished to each foreman. The first was a detailed statement of charges and credits to the departments with the resultant variations from standard, and the second, a summary sheet giving comparative figures for the preceding period. The detailed or Cost and Variations Sheet is shown in Form 1.

At the top the percentage of activity for the center is shown worked out. It is seen that the unit of measurement was the shop-hour and that the normal production was set at 1,850

COST AND VARIATIONS SHEET

PRESS DEPARTMENT

	Shop Hours	%
Normal	1,850	100
Actual	1,295	70

Four Weeks Ending

Account No.	Account Name	Normal Budget	A Expenses Earned	H Actual Costs	Net Variation	Analysis of Variations				
						Chargeable Labor	Variable Expense	Fixed Expense	Adminis-trative	Commercial and Selling
101	Direct Labor	$ 5,200	$3,640	$3,420	$220	$220				
102	Indirect Labor									
103	Supervision									
104	Supplies	100	70	85	15*		$15*			
105	Maintenance									
106	Heat									
107	Light									
108	Power									
109	Taxes									
110	Depreciation	2,540	1,778	2,540	762			762*		
111	General Exp.									
	Total	$12,400	$8,680	$9,140	$460*	$220	$160	$840*		

NOTE: Only a portion of the figures are included for illustrative purposes.

* Loss.

Nepaul Co.

FORM 1.

hours. The actual output for the period was the equivalent of 1,295 hours' work at standard, giving a percentage of activity of 70.

The account numbers and names from which charges were made to the department were filled in along with the normal budgeted expenditures for a four-week period. These amounts were multiplied by the percentages of activity to obtain the credit to the department for good production as given in column "A." The actual costs, direct and distributed, were entered in column "H," which was followed by the net variation. The net variation on each line was then extended into the correct column in the "Analysis of Variation" section. These columns were then subtotaled to give the direct charges as compared with the total charges.

The second report was known as an "Operating" Statement, and was made up separately for each department or cost center. On this sheet were entered, for comparative purposes, the actual cost, standard cost of the good production, net variation, and the analysis of variations as given on the Detail Cost Report for the department. One line was used for each of these items and the amounts entered in the column for the period. There were 14 columns on the sheet, 13 of them for the successive periods throughout the year and the last one in which a cumulative total was given for the year to that date.

Did these reports furnish the foremen with all the information which they should have had for control purposes?

Have you any criticism of the manner in which these reports were made up?

6. Adamson Machine Company

REPORTS FOR FOREMEN: HOW MAY PRODUCTION EXECUTIVES BE INDUCED TO TAKE AN INTEREST IN COST REPORTS?

The executives of the Adamson Machine Company, especially the vice-president in charge of production, were of the opinion that cost information could be made helpful to their foremen, through whom it might contribute to a lower cost of production.

COST AND VARIATION SHEET

Productive Units—Shop Hours 1,850 1,295 Shop Center—Press Dept.

Ratios 1.0000 .7000 4 Weeks Ending Aug. 25, 1928

Account No.	Account	Standard Cost		Actual Cost	Net Variation	Analysis of Variations			
		For 4-Week Period	For Good Production A	H	H-A	Chargeable Labor H-A	Variable Expense H-A	Fixed Expense H-A	Administrative Expense H-A
5105	Chargeable Labor	4,000.00	2,800.00	2,950.00	*150.00	*150.00			
5195	Supervision	200.00	140.00	200.00	* 60.00			* 60.00	
5119	Misc. Non-chargeable Labor								
5139	Misc. Supplies	100.00	70.00	50.00	20.00		20.00		
5140	Repairs and Maintenance	249.04	174.33	153.33	21.00		21.00		
5141	Mold Repairs and Maintenance	270.00	189.00	190.00	* 1.00		* 1.00		
5142	Molds—New and Replace	500.00	350.00	290.00	60.00		60.00		
2100	Fixed Charges	566.67	396.67	566.67	*170.00			*170.00	
	Sub-total of Direct Charges	5,885.71	4,120.00	4,400.00	*280.00	*150.00	100.00	*230.00	
5150	Excess Breakage		15.00		15.00		15.00		
5151	Defective Ware Loss	100.00	70.00	105.00	* 35.00		* 35.00		
	Sub-total	5,985.71	4,205.00	4,505.00	*300.00	*150.00	80.00	*230.00	
3000	Building Factor	70.00	49.00	70.00	* 21.00				* 21.00
3100	General Factory	972.86	681.00	972.86	*291.86				*291.86
3200	Power Plant	100.00	70.00	100.00	* 30.00				* 30.00
3300	Gas and Producer Plant								
	Total	7,128.57	5,005.00	5,647.86	*642.86	*150.00	80.00	*230.00	*342.86

* Loss.

Nepaul Co.

FORM 2.

A good deal of attention was given to the cost system, with a view to assembling all data that might be considered useful, and special care was taken to set up reports to foremen in terms which, it was hoped, would both interest them and suggest definite action on their part. Meetings of foremen were held under the guidance of the works manager, and steps were taken to arouse discussion among them, to show them that the reports were prepared to assist them to become better foremen, and to suggest definite lines of improvement.

At first it did not seem that much progress was being made; the foremen spent most of their efforts in questioning the utility of the figures in general and the accuracy of some items in particular. There was among the foremen, however, a young man who had been advanced to that rank because he had shown proficiency and resourcefulness as a time clerk and cost man. This foreman was naturally alert to see the significance of the cost figures and on several occasions was able to do better than the standard expense allowances of his department. Finally, when some of the foremen were protesting about the reports, this man remarked to them that if they would devote half as much energy trying to meet the standard allowances made to them for expenses as they did to grumbling about the matter, they would get more satisfactory results. This observation made an impression on the general body of foremen, and led to a considerably improved spirit in the matter of using the figures to effect operating economies. In fact, the influence of this one foreman was found to be distinctly beneficial on all occasions of this sort, and his production performances were equally satisfactory. The orderly discussion of cost figures, looking to better performance, became a regular part of the business of foremen's meetings.

PART III

ADVANCED PROBLEMS IN MANUFACTURING COSTS

IV

PRIME OR DIRECT COSTS

A. MATERIALS AND INVENTORIES

1. Star Shipbuilding Corporation

FREIGHT AND EXPRESS: HOW SHOULD FREIGHT AND EXPRESS ON PURCHASED MATERIALS BE CHARGED?

The following quotation is taken from the *First Report and Recommendations on Uniform Methods of Cost Accounting in Shipbuilding*, May 21, 1919, of the Committee on Uniform Methods of Cost Accounting of the Atlantic Coast Shipbuilders' Association.

> The cost of handling materials and supplies should be charged as part of general works expense. While in some cases it may be desirable to add such costs to the invoice cost of materials and supplies, it is suggested that for the purpose of simplicity and uniformity the method above recommended should be used.

The Star Shipbuilding Corporation was a member of the Association, but did not see fit to adopt the committee's recommendation of charging freight and express to general works expense. The instructions of the auditor of the company to his department included the following:

Freight and Express Procedure

(*a*) *Freight.* Transportation companies shall be required to supply to the company at least one copy of a Waybill or a Billing memorandum in order that the company may be able to identify a shipment and to facilitate the passing of Freight bills upon their receipt. The Waybill should be in charge of the receiving clerk, who should enter thereon such matters of information pertaining to the shipment as will enable him to identify the Purchase Order, and to file it so as to facilitate the checking of Freight bills and the applying thereto of the Purchase Order numbers. The Freight bills should be rendered in duplicate, and handled as follows:

1. The original should be submitted to the transportation department for the approval of rates and then returned to the invoice clerk for comparison with the duplicate, for notation of the accounts to be charged, and for the preparation of the Accounts Payable Voucher.

2. The duplicate should be forwarded to the receiving clerk, who should apply thereon the Purchase Order number which he will transcribe from the copy of the Waybill which he should have received with the shipment. The receiving clerk should promptly return the duplicate copy of the Freight bill to the invoice clerk.

3. Upon receipt of the duplicate Freight bills from the receiving clerk, the invoice clerk should transcribe the Purchase order number to the original copy of the Freight bill. He should then refer to his copy of the Purchase order to find out what accounts are to be charged.

The invoice clerk should arrange for the prompt attention by the transportation department to the original, and by the receiving department to the duplicate, so that he will be enabled to pass Freight bills quickly. Care must be exercised by the invoice clerk to see that Freight bills are passed only when proper; it frequently occurs that vendors fail to show "Freight" as a separate item, even though they have paid it and included it in the bill.

The invoice clerk should enter the number of each Freight bill and its amount upon the Accounts Payable Voucher (duplicate, triplicate, and quadruplicate) in the space provided. Payment of Freight accounts should be expedited and made to conform with the requirements of the local transportation companies.

(*b*) *Express.* When express companies deliver their shipments (inbound) they shall be required to furnish a copy of the Statement of Shipments, so as to enable the receiving clerk to have a means of identifying shipments, as well as to assist the invoice clerk in the passing of express bills. This shipping memorandum should be attended to by the receiving clerk in the same manner as the Waybills; namely, he should make a note of the Purchase Order number of each shipment and forward it to the invoice clerk. He transcribes this Purchase Order number from the shipping memorandum to the express bill, on which he also notes the account to be charged. This process should make quick attention to express bills possible.

It is understood that freight and express bills will be rendered almost daily so that an Accounts Payable Voucher can be prepared for each set of bills. The distribution of Freight bills can be made directly from the Accounts Payable Voucher through the regular columns of the Accounts Payable Register.

The company's inventory was classified into four main groups, namely, Materials, Parts, Structural Units, and Supplies.

Should the Star Shipbuilding Corporation have followed the recommendations of the Association with regard to charging freight and express?

What reasons probably induced the Star Shipbuilding Corporation to handle this matter as it did?

2. Marston and Mallin Company

RECEIVING PROCEDURE: WHAT ROUTINE SHOULD BE FOLLOWED WHERE MATERIAL RECEIVED HAS TO BE SENT TO DIFFERENT PARTS OF THE PLANT FOR INSPECTION?

The receiving department of the Marston and Mallin Company had been located on the second floor of the plant in the vicinity of the elevators. The materials and supplies purchased, which consisted mainly of two groups, were delivered to the receiving clerk near the point where he was stationed, and where he endeavored to carry out his duties. The first of these groups, known in general as "raw materials," was made up mainly of paper, envelopes, and boxes which were kept in a storeroom in the basement. The other group, spoken of as "semifinished stock," consisted of cards and other materials which had been processed by outside printers, die stampers, and lithographers. These materials were forwarded to the third floor, where they were unpacked, sorted, and delivered to the counting tables where the number received was ascertained. Special items which had been ordered by individuals in the plant were forwarded to them for approval. The storeskeeper or the requisitioner wrote out a detailed memorandum of the goods and returned it to the receiving clerk, who copied the information in a Day Book in which a record was kept of all items received. He then wrote out, a second time, on a blank slip of paper the details of the shipment and sent this memorandum to the purchasing office as its advice needed for the approval of Purchase invoices.

In a comprehensive study of the methods used throughout the organization, the management considered that this receiving procedure was unsatisfactory and developed a new routine to be carried out. The receiving clerk was moved to the receiving platform where all incoming items were handled. He was provided with an office at that point so that he could carry on his duties conveniently in all kinds of weather. A Receiving Record was designed and made up in pad form, an original and one carbon copy being provided for. A copy of the Purchase Order was also sent to the clerk who placed it on file until the goods were received.

When materials were delivered, the clerk signed the Vendor's receipt, retaining one copy: he took from the file the Purchase Order relating to the goods, on which he entered the date of receipt. He then filled in the receiving form giving the vendor's name, date, Purchase Order number, and the number of items in the shipment, after which he forwarded the goods with the original of the Receiving report to the storeroom or department for which they were scheduled. The parties responsible for the materials at those points filled in on the Receiving report the detailed information regarding the items and sent the slip to the receiving clerk.

On the return of the original copy of the Receiving report, the clerk checked it on the carbon in his pad as having been sent back; then, if the shipment constituted the entire order, he fastened together the Purchase Order, Vendor's receipt and the original Receiving report and sent them to the purchasing department, for their guidance in the handling of invoices and for the information of the Stock ledger clerks.

The receiving clerk was held responsible for the prompt notification of the purchasing department of the material, and each day checked up all the original copies of Receiving reports that had not been returned to him.

One other duty was placed upon the receiving clerk in connection with printing and engraving work done in outside plants. He was furnished with copies of the outside Printing orders and was made responsible for seeing that the material sent out was properly packed and labeled and also, if dies were to accompany the stock, that the correct ones were sent. He did not make a special report to cover this work, but entered the date of shipment on his copy of the outside Printing order, which was returned to the production control office.

Did the management develop a satisfactory receiving procedure?

Under what circumstances should inspection of purchases take place in the receiving department and when should it be carried on in the different parts of the plant to which materials are scheduled to go?

What reasons would justify despatching materials for outside printing orders from the receiving department rather than from the regular shipping department?

3. F. E. DEVEREAUX TIMBER COMPANY

STUMPAGE COSTS: HOW SHOULD STUMPAGE BE CHARGED FROM TIMBERLANDS TO MILLS?

The instructions of the F. E. Devereaux Timber Company, one of the largest timber-owning interests in the country, for the preparation of the annual reports of its mills, read as follows:

> Stumpage[1] will be credited as high as the business of the year will reasonably warrant.

In the past many operators who owned their own timberland did not consider that the original cost of the stumpage should be charged into the cost of the manufactured lumber because of the low price at which their timber properties were originally obtained; because of the rapid advance which had taken place in the value of timberlands; and because of the high percentage of overrun.[2] Since most of the large holders of timberland did little cutting on their lands, the increase in value of the stumpage remaining on their property had been such that the value of the property had usually been greater, even after considerable timber had been removed for current operations, than when the property was originally purchased.

Great increases in stumpage values have taken place. Figures in the *Report of the United States Commissioner of Corporations on the Lumber Industry* give the advances in price for identical tracts of timber as follows:

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[1] The term "stumpage" is used in the trade to indicate standing timber suitable for sawing into lumber.

[2] Overrun—The amount by which the scale of the lumber (feetboard measure) produced from a given lot of logs runs over the scale of those logs as obtained by use of one or another of the various log rules in use.

State	Earlier Sale		Later Sale	
	Date	Amount	Date	Amount
By Tracts:				
Virginia	1902	$ 24,000	1906	$ 153,000
Washington	1901	127,500	1906	500,000
Washington	1900	6,000	1907	96,000
Washington	1900	11,840	1907	115,000
Oregon	1892	24,000	1907	460,000
Idaho	1901	240,000	1909	2,500,000
Per Acre:				
Louisiana	1882	$1.25	1909	$ 59.50
Arkansas	1900	1.00	1904	13.50
Wisconsin	1894	1.25	1908	30.00
Washington	1896	5.00	1908	108.75

From 1895 to 1897 one company made large purchases at an average cost of about 40 cents per thousand boardfeet. During the next four years the average price was about twice as great; during the three years following, three times as great; and during the next five years, five times as great. Moreover, the real increase was greater than this because the timber obtained by the earlier purchase was much more than was shown in the estimates, the estimates of the early years being exceptionally conservative. Like increases have taken place in all parts of the country and in almost all species of timber.

If the price of lumber can be advanced by the manufacturer it simply means a higher price for his timber. On a rapidly rising market the price of timber does not keep pace with the price of lumber, and some extra profit comes to the manufacturer as such. The rise is soon reflected, however, in the price of timber. Speaking broadly, it may be said that the price of timber tends never to fall. A fall in the price of lumber is believed to be only temporary, and the strong timber owner therefore awaits the future profit. Any temporary recession of lumber prices appears as a deduction from the profits of manufacture and his balance by the excessive profit made on a rapidly rising market. Thus during the boom years ending in the latter part of 1907, the manufacturer as such made high profits, for the price of lumber was considerably in advance of the price of timber. Timber did advance considerably, however, and during the business depression which began toward the close of 1907 there was much complaint that the manufacturers were losing money because, speaking generally, timber prices did not fall, and the cost of manufacture was reckoned as including the timber prices established during the preceding boom in the market. Any manufacturer who had bought timber at those prices may have suffered an actual loss through cutting timber when the margin left for it from the price of lumber was less than the price paid; but nearly all the mills of any importance were cutting timber which they had bought years before at low prices, and were losing only in the sense of making less than the boom had led them to expect.[1]

If stumpage were to be credited as high as the business of the year would warrant, it would have meant that, contrary to the general tenets of accounting practice, stumpage would in effect have been carried at market even though the original cost price was considerably lower.

Was there any justification for the statement included in the instructions of the F. E. Devereaux Timber Company to its mills for the preparation of their annual reports that "stumpage will be credited as high as the business of the year will reasonably warrant"?

How should the price to be charged by the company to its sawmills be determined for the stumpage coming to the mills from the timberlands of the company?

4. Rogers Chemical Company

TRANSFERS BETWEEN DEPARTMENTS: AT WHAT PRICE SHOULD MATERIAL BE TRANSFERRED FROM ONE DEPARTMENT TO ANOTHER?

The Rogers Chemical Company manufactured two chemicals which may here be termed "the alkali" and "the acid." The raw materials used for the two products were approximately the same, though any given lot of raw materials was usually more suitable for either the alkali or the acid according to the percentage of purity content, and the character of the impurities. The manufacturing processes for the two departments were practically a series of refining operations; they were entirely

[1] United States Commissioner of Corporations, Summary of *Report on the Lumber Industry.*

separate for the two products, except for a small department in which raw materials for both products were given a preliminary grinding.

When materials in the alkali department had been refined to a certain point, and the bulk of the alkali content extracted, there was always a residue which it was not economical to refine further and which was, therefore, transferred to the acid department and there combined with new raw materials, the total quantity of these transfers being very considerable. High-grade raw materials cost from 20 cents to 25 cents per pound, and low-grade materials from 10 cents to 20 cents per pound, materials all being bought on a purity content.

There was constant dispute as to the value which should be attached to the transfers. The Rogers Chemical Company used both the acid and the alkali products in one of its subsidiaries, in the preparation of a medicinal product which contained them in fixed proportions; but large quantities both of acid and alkali were also sold separately and independently. In actual purity content the transfers resembled low-grade materials which could be purchased for about 12 cents per pound; but the transferred material was not in as good condition for working as the material bought in the market. It was further argued that the removal of this transferred material conferred benefit on the alkali department and placed some burden on the acid department.

A complication arose from the fact that a manufacturing loss of about 15% occurred in both departments; this loss was difficult to measure, but it was believed that the transferred materials incurred a greater loss than newly bought materials.

Still another difficulty in transferring materials was that the purity content must be changed according to the relative molecular weights of alkali and acid, which were approximately in the ratio of 4 to 5; that is, from a given quantity of raw materials of a certain purity either 4 pounds of alkali or 5 pounds of acid might be obtained.

Of the considerations given, which should have been regarded as controlling in the determination of a price for the materials transferred?

Using the above figures, what price would have been fair for these transfers?

Was it important to fix a reasonable price for these transfers?

5. Alestes Manufacturing Company

INVENTORY TAKING: WHAT DETAILS SHOULD BE CONSIDERED IN TAKING PHYSICAL INVENTORY?

The management of the Alestes Manufacturing Company wished to develop a system which would insure taking an accurate inventory. At that time the company made 2,392 different articles, such as hammers, saws, gimlets, screw-drivers, bolts, nuts, screws, safety razors, and locks. Since its formation, the company had always maintained a reputation for producing high-quality products. The management, which had been in control for 22 years, had directed most of its efforts towards maintaining this reputation, and very little attention had been given to any aspect of scientific management.

For a year competition had been particularly severe, the result being that the books of account showed a loss of over $93,000. This fact, more than any other, had served to convince the manager of the danger of this lack of system. The slipshod methods of taking the inventory had been one of the principal sources of error and confusion. Not infrequently, after the inventory clerks had reported merchandise on hand, the shipping department had found that this merchandise was not available, because a mistake had been made in taking the count.

In the plant of the Gordon Electric Company over 6,000 different kinds of electrical equipment, including generators, dynamos, fans, bulbs, sockets, plugs, fuses, switchboards, and transformers, were manufactured. Harvey L. Anderson, cost accountant for this company, had furnished the manager of the Alestes Manufacturing Company with a copy of the instructions issued to inventory supervisors at his plant. The Alestes Company's manager was considering how far these instructions, which are given in full below, would fill his needs, and how far they needed revision.

General Inventory Instructions for Inventory Supervisors

Inventory cards will be sent to some of the departments. For the departments using cards, these cards are to be used merely for collating the final figures, and they must not be carried around the room. For the departments using sheets, these sheets are only to be used for collating the final figures. All original sheets and memoranda must be preserved until permission is given to destroy them. This permission must be obtained from the Cost Accounting Department.

Preparatory Work for Inventory

Previous to the taking of inventory the stock and workrooms should be cleaned up and all items stacked up in an orderly manner. Materials of like nature should be grouped in some definite arrangement so as to enable a rapid count to be made. Material hidden away in corners, and in similar places, should be brought out where it will receive attention. Dropped and slow-moving material should be stacked separately or marked in some manner so that a separate list of it can be quickly taken and *not* included with the regular inventory.

So as to avoid congestion and errors in inventory, all interdepartment orders, stock orders, and the like, that are being held, must be priced and sent through to be charged *at once.*

Clerks should be properly instructed as to how they should count, enter, check, and the descriptions to give, so that the material can be properly figured. *Special care should be used with partly manufactured stock.*

Method of Taking

Material in all manufacturing departments, store or stock rooms should be taken on the numbered inventory cards which can be obtained from the Cost Accounting Department. Definite series of numbered cards should be given to the clerk or clerks who are to list the inventory, and these should be receipted for and a record kept by the chief inventory clerks. The cards will be distributed by a responsible clerk who will place one card, in a conspicuous manner, on each bin, tray, or class of material. They are to be distributed in consecutive order throughout the entire stockroom so that when collected, it can be done in numerical order.

When the blank numbered cards have been distributed, the clerks will then count the material and enter on these cards, stating building, section, floor, order number if any, quantity, article, and complete description so that it can be properly costed. Entries as to quantity must be complete, and the clerks must designate whether units shown are for singles, 100's, M's, pounds, dozens, grosses, and so forth. Clerks should be given certain definite sections to take inventory so that no aisles or sections will be omitted or taken twice.

After the entries have been made some of the tags should be tested by the person in charge to see that the stock is being counted correctly. After all stock has been counted and the inspectors are satisfied that all items have been properly counted, the cards are to be collected in numerical order and checked to see that none is missing. All voided and unused tags should be accounted for and returned to the office. Inventory taking in large stockrooms should be started several days in advance. The departments must be very careful that all additions and deductions to or from the stock up to January 1 be made on the cards. This was done better last year, but there is still plenty of room for improvement.

All other material on the floor, benches, and so forth, is to be listed on the rough sheets of a uniform size and color which must be obtained from the Cost Accounting Department, care being used in stating units, descriptions, and so on, as mentioned above. Extreme care should be used to see that no material is overlooked.

Listing of Inventory

On Cards. For quantities collated and entered on the Final Inventory cards there should be one card covering all goods of one kind belonging to the same account, and a separate line on the card for each section and floor. The quantities on each card should then be totaled and multiplied by the unit cost. Additions and multiplications on the cards will be checked in the main office, but the quantities entered and the unit costs will be entirely up to you and the departments to get right. Also see that the account number entered at the top of the card is correct.

On Sheets. Quantities should be collated and entered on the Inventory sheets according to building, section, and floor. No one sheet should contain items for more than one particular section or floor.

Only one item should be entered on a line.

As entries are made from the numbered Inventory cards or from the original rough sheets, the items on the original data are to be plainly checked.

Every entry should be complete as to quantity and description so that there will be no doubt as to what the item is.

Write out the unit for every item. Do not use ditto marks in the unit column.

No writing should extend into the money columns.

Instructions given in the second and third sentences under "On Cards" apply to entries on sheets as well.

On both cards and sheets the entries must state whether units are singles, M's, dozens, and so forth. If the head of a column should read "Thousand," the entry, say, for 1½ M should not be written 1,500, because it is not known by the clerk extending whether this is 1½ M or 1,500 M.

METHOD OF PRICING

Every cost entered on the sheets must specify whether it is for singles, dozens, grosses, 100's, M's, pounds, or what not. For special items figured on sheets where a *lot* cost is figured for the entire quantity, this total is to be entered on both the unit cost column, and marked "Lot," and again in the last extension column at the right of the perforation. For the first extension of the Inventory sheets the amounts are to be entered in the outside extension column at the right of the perforation.

PART SHIPMENTS

All orders showing a record of part shipments having been made previous to January 1, 1921, must be charged to the Sales Division instead of taking them in the inventory. Where part orders have been shipped prior to January 1, you should advise the Accounting Department, giving them the name, order number, district, and state so that they can attend to the matter of charging the Sales Division. All such parts must be charged out by January 4, and after January 1 must be sent direct to the Accounting Department by special messenger.

INTERDEPARTMENT ORDERS

All goods not actually delivered to other departments before January 1, 1921, must be taken in inventory by the department furnishing, and all goods delivered, whether taken from the trucks or not, must be taken in stock by the departments receiving. All vouchers received in the Accounting Department *prior* to January 5 will be considered as 1920 business, and no vouchers for 1921 must be sent through until January 15.

DROPPED AND SLOW-MOVING ITEMS

All dropped and slow-moving items charged off in previous years, for which we still have stock on hand, *should not* be taken in the regular inventory.

All dropped items which were dropped this year and not charged off should *not* be taken in a regular inventory but must be listed separately and properly marked. This will include such items as boxes, cartons, lithographed tops, and cut stock as box forms, and so forth, left over that cannot be used on or for other merchandise. This must be in my hands by January 22, all priced; otherwise your division can receive no credit.

GENERAL

All data affecting inventory totals must be sent to me and not to the Accounting or any other department, as I am responsible for the inventory figures that are to be posted to the ledgers.

All time required to take inventory should be shown separately on the Payroll Distribution sheets under a column headed "Inventory Taking." This applies to the clerical as well as to the stock taking and non-clerical help.

The inventory is practically the only figure which goes directly from this factory on to the company's books. It affects our Profit and Loss account, our account to the Government, and our insurance arrangements. Therefore, extreme care must be taken to get it right.

Please read these instructions over again and pay particular attention to instructions regarding showing locations, designating the unit of put-up, care of dropped merchandise, and additions and deductions for inventory taken previous to January 1. Many departments were careless on these points last year.

Please feel very free to ask any questions concerning methods, valuations, or any other point on which you may be in doubt.

COST ACCOUNTING DEPARTMENT
HARVEY L. ANDERSON

How far would these instructions fill the needs of the Alestes Company's manager?

6. SOME VARIATIONS IN INVENTORY VALUATIONS[1]

Cost or market, whichever is the lower, is still the most widely accepted rule for valuing inventories of raw materials, work in process, and unsold finished stock. Under steady price conditions, it is undoubtedly the safe and reasonable rule; moreover, there is very great advantage in a uniform and generally recognized practice, since no one is then left in doubt as to the basis on which this item has been determined and profits computed. But it is doubtful whether an item of such importance can be left to the arbitrary action of any single rule, and, as a matter of fact, there is very high business and accounting authority for modifications under certain conditions.

The present article consists in substance of a comparison between the practices of the National Lead Company, the International Harvester Company, and the United States Steel Corporation, as shown by a study of their annual reports during the last fifteen years, but with special reference to the war period.

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[1] "Some Variations in Inventory Valuations," by T. H. SANDERS, *The Journal of Accountancy,* vol. 42, No. 6, p. 429, December, 1926. Reprinted by permission.

Incidentally one gets an interesting contrast in methods of reporting to stockholders, and of certification by outside auditors as authority for published statements. The net result of this investigation is that a broad view of the subject of inventory valuation may well require substantial modification of the common rule, without resorting to measures too drastic for reasonable consideration. At the present moment, moreover, there seems to be some tendency for inventories to increase, and there is a possibility that accountants may again be confronted with a mild form of the problems which faced them in 1920.

NATIONAL LEAD COMPANY

The National Lead Company gives very little accounting information in its annual reports, offering practically no details concerning profit and loss, and very few comments on the balance sheet. The annual reports from 1917 to 1925, inclusive, contain no mention of any public accountant having seen their records or certified their accounts. This comment is not intended as a stricture; the entire series of reports creates an impression of solidity, cautious yet effective management, and a desire on the part of the directors to do their duty to their stockholders, their employees and the public. Nevertheless, the adequate reporting and authentication of company results is of importance, and the National Lead Company is conservative in this respect.

From 1911 to 1913 no remarks are made on the inventory in the report. The 1914 report contains the statement, "Inventories have been taken on our usual conservative basis." In 1915 an item entitled "Metal Reserve" appeared on the liability side of the balance sheet to the amount of $200,000. By way of explanation it was stated that this amount was to cover rises in the market prices of tin and antimony—rises which were then expected to be reversed in the near future. In 1916 this metal reserve was increased to $300,000, and the same figure appeared in the 1917 report.

In 1916, 1917, and 1918, each annual inventory showed an increase of $1,000,000 over the previous year. In the last-named year the metal reserve was accordingly increased to $1,000,000, and reference was made in the report to the necessity of keeping a minimum quantity of stock on hand, in order to do business. In 1919 a further million was added to the inventory, and in 1920 the increase was three and a half million dollars. It was at this point that the company printed in its annual report the statement that it had throughout the war valued lead, the main item in its inventory, at 3.4 cents a pound, the lowest price at which purchases were made during 1914. The explanation given was as follows:

> Our normal-stock system of taking inventories has been followed in the preparation of this statement, with the exception noted below.
>
> Prior to the war, the National Lead Company divided its inventories into normal stocks and excess above normal. The normal stocks were valued at the lowest price reached by metals in the year 1914. The excess above normal was valued at cost. The normal stocks never change—either in quantity or value placed thereon. The excess above normal varies in quantity and value according to the facts. In case of an encroachment upon the normal stock at any branch creating a deficiency, a reserve is created in the normal-stock inventory sufficient to buy the amount of such deficiency at the replacement value of the metal at that time—the first metal purchased being used to make good the deficiency in the normal stock.
>
> In fixing the amount of normal stocks, we determine the amount of metal (whether lead, tin, copper or antimony) in the following manner:
>
> 1. The amount of metal normally in transit to our factories.
> 2. The amount of raw metal necessary in the factories to prevent possible stoppage of manufacturing, due to transportation or other difficulties.
> 3. The amount of metal in process of manufacture, which in case of white lead extends over several months.
> 4. The amount of manufactured products necessary to be carried in stock at factories and warehouses, in order to make prompt deliveries.
>
> The result is that about 80% of our total inventories is in normal stocks. Inasmuch as the purchases of raw materials from month to month approximately equal our sales of metal in the form of manufactured products from month to month we adopt the fiction:—that the metal sold in the form of manufactured products during any given month was made out of the metal bought during that month, and the normal stock is never touched, and our inventories, therefore, are valued at cost.
>
> For all practical purposes, the normal stock is like a piece of machinery which the company has to have always on hand in order to

operate. When the price of pig lead, for instance, went to 11 cents a pound, the National Lead Company could not make an actual profit thereon without selling its normal stocks, but, in that event, it would either have to buy back such normal stocks at the then market or go out of business. In the latter case, it would lose the value of its goodwill and the cost of the marketing, which would be far greater than any possible profit on sale.

This being true we do not deceive ourselves by marking up inventory values and taking book profits, upon which we could not realize, to be followed later by book losses of like amount. Bookkeeping is likely to affect policy. By taking book profits on ascending markets of raw material, a company is likely to be led into extravagance and wastefulness. On the other hand, book losses during a period of declining markets are likely to be discouraging and may become embarrassing. Our stockholders are also likely to be deceived by apparent high earnings followed by severe losses, if such book profits and losses are reported in our published statements.

The advantage to the company of this safe and conservative method of taking inventories has been made manifest during the last few years. For instance, the market price of pig lead advanced from the low price of $3.40 per hundred pounds, at which our normal stock of lead is inventoried, to $11 (or higher) during the war years, and on December 31, 1920, it had fallen to $4.75. Inasmuch as we have never taken any book profits, we do not now have to take any book losses. It would have been just as reasonable to mark up the value of our plants and machinery to the replacement value thereof during the war years (with a consequent showing of book profits), and then write them down to present replacement values (with a consequent showing of book losses), as to make similar variations in our normal stock.

Of course, as to our excess above normal stocks—which have always been inventoried at actual cost until written down to the market on December 31, 1920—we have, like all others who have inventoried at market or cost (whichever is lower), made profits and losses. But these, while serious, are relatively unimportant.

Because of the unusually rapid and pronounced decline in the market price of metals at the close of the year, it was deemed prudent to create additional normal stocks where needed, and inventory all excess above normal stocks at the market instead of at cost. Inasmuch as the normal-stock system of inventory, as above described, automatically creates in itself a metal reserve, the metal reserve of one million dollars—created in 1918—was used for this purpose, as originally intended.

The significance of this policy may be gathered from the two tables given on the opposite page. From the 1922 report one learns that the "normal stock" of lead had been 80,000 tons;

the net effect is, therefore, that the inventory has been written down from the usual cost or market basis by the difference between 3.4 cents a pound and current prices, multiplied by 80,000 tons. For purposes of this computation the average annual prices for pig lead have been used,[1] which are doubtless a fair approximation to what cost or market would be in any one year.

TABLE 1

SHOWING ADJUSTMENT OF INVENTORIES OF NATIONAL LEAD COMPANY FROM NORMAL TO "COST OR MARKET"

	Lead Basic Inventory at Lowest 1914 Price	Average Market Price for Year (Cents)	Basic Inventory at the Year's Average Price	Excess over Basic Value	Total Inventory as Reported	Total Inventory Adjusted
1913	$5,440,000	4.4	$ 7,040,000	$1,600,000	$ 7,300,000	$ 8,900,000
1914	5,440,000	3.9	6,240,000	800,000	7,200,000	8,000,000
1915	5,440,000	4.6	7,360,000	1,920,000	6,300,000	8,200,000
1916	5,440,000	6.8	10,880,000	5,440,000	7,300,000	12,700,000
1917	5,440,000	9.1	14,560,000	9,120,000	8,200,000	17,300,000
1918	5,440,000	7.4	11,840,000	6,400,000	15,000,000	21,400,000
1919	5,440,000	5.8	9,280,000	3,840,000	16,000,000	19,800,000
1920	5,440,000	8.1	12,960,000	7,520,000	19,600,000	27,100,000
1921	5,440,000	4.6	7,360,000	1,920,000	20,600,000	22,500,000
1922	5,440,000	5.8	9,280,000	3,840,000	19,600,000	23,400,000

TABLE 2

SHOWING CORRESPONDING ADJUSTMENT OF PROFITS

	Reported Net Earnings	Excess over Value	Net Profits Inventory at Average Market
1914	$2,500,000	$ 800,000	
1915	2,700,000	1,920,000	$3,820,000
1916	3,000,000	5,440,000	6,520,000
1917	4,900,000	9,120,000	8,580,000
1918	4,700,000	6,400,000	1,980,000
1919	4,600,000	3,840,000	2,040,000
1920	4,700,000	7,520,000	8,380,000
1921	3,500,000	1,920,000	2,100,000*
1922	4,900,000	3,800,000	6,780,000

* Loss.

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[1] *Bureau of Labor Statistics,* Bulletin No. 367, pp. 144–5.

The effect of these comparisons is shown graphically by the following chart:

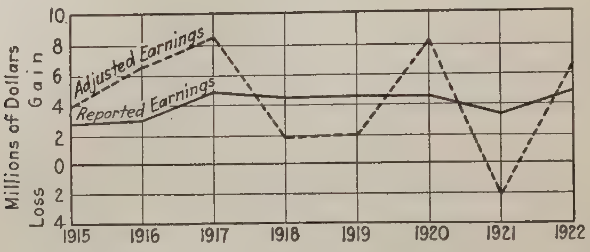

CHART 1.

In 1922 the report stated that the Bureau of Internal Revenue had disapproved of the company's normal-stock method of valuing inventory, which necessitated submitting to the government revised returns, with inventories at cost or market, whichever was the lower. The report stated that in the long run this would make no difference in the amount of taxes payable. Most accountants understand, however, that on account of excess-profits taxes at varying rates, and also because of changes from year to year in the rates of taxation, the year in which income is reported does make a difference in the amount of taxes paid over a series of years.

The 1922 report also stated that the metal reserve covers the excess costs on the inventory over and above the normal quantity; this means that the entire inventory, normal and excess above normal, was practically marked down to a pre-war basis.

Further arguments in favor of the company's normal-inventory method appear in the 1924 report. A table was appended to show the wide fluctuations in profits which would have arisen during the preceding fifteen months on the normal inventory of lead, now 96,000 tons. During the first three months increases in market prices would have given a profit of $3,840,000; during the next three months precisely this amount would have been lost again. In the next eight months a profit of $6,720,000 would have been made through increased prices, and over one-third of this would have been lost again during the next month. In the report of the following year the company stated that every 1 cent a pound change in the market price of lead meant $2,000,000 to its inventory. The National Lead Company is still carrying its normal inventory of lead at the base price of 3.4 cents a pound, and to this extent eliminates price fluctuations in the computation of its profits.

An interesting comment on this situation was made by a well-known investment service, which stated that, as a result of the normal-inventory method, the company showed "no fancy bookkeeping profits during the war period." One would like to know if the writer knew precisely what he meant.

INTERNATIONAL HARVESTER COMPANY

The International Harvester Company's experiment in stabilization through the inventory was not quite so thoroughgoing as that considered above. The Harvester Company began only in 1917; it used 1916 prices to value its "basic" (i.e., normal minimum) inventory, and abandoned this value in 1921 because current prices had gone below their base price. The figures of four years only, therefore, 1917–1920, inclusive, are affected, but the steadying effect on profits was almost as marked as in the case of the National Lead Company. The importance of the problem to the International Harvester Company may be judged by the fact that its inventory averages 60% of its annual sales. The following extracts from its reports will show the procedure:

December 31, 1916

Raw materials, work in process, and finished products were valued at cost, which was lower than market at December 31, 1916. In view of the rapid rise in raw-material prices and the uncertain conditions surrounding their future course, an addition of $1,000,000 has this year been made to the inventory depreciation reserve, making the total reserve $2,750,000, which amount has been deducted from the inventories.

December 31, 1917

Raw materials, work in process, and finished products are valued at 1916 inventory prices (being the actual cost of that year), which are adopted as a fair and stable basis for inventory valuations during the period of the war. In addition the company is carrying the general inventory of reserve previously accumulated.

December 31, 1918

Note.—The "basic" inventory, representing a normal quantity of raw materials, work in process, and finished products, has been valued at 1916 inventory prices (being the actual cost of that year), which were adopted in 1917 as a fair and stable basis for inventory valuations during the period of the war. The "excess" inventory (that is, the quantity in excess of normal) has been valued at reasonable market prices. In addition, the company is carrying the general inventory reserve previously accumulated.

December 31, 1919

The "basic" inventory, representing a normal quantity of raw materials, work in process, and finished products, is valued at 1916 inventory prices (being the actual cost of that year), which have been adopted as a fair and stable basis for inventory valuations during the period of high prices. The "excess" inventory (that is, the quantity in excess of normal) is valued at 1919 cost or market, whichever is lower. The general inventory reserve of $5,975,000 existing at December 31, 1918, has been utilized during 1919 in the disposition of war losses.

December 31, 1921

The rapid decline in market values during the year 1921 of the commodities entering into the company's products has resulted in price levels that make unnecessary the continuation of the "basic" inventory method of valuing inventories; therefore, raw materials and supplies, including purchases after the close of the manufacturing season, have been valued at cost or market, whichever was lower, at December 31, 1921. Work in process of manufacture and finished products have been valued at replacement cost, based on market values of raw materials and labor rates at December 31, 1921, such replacement cost being lower than the year's cost of production.

The situation was somewhat complicated by the fact that for part of this period there were two corporations, the International Harvester Company of New Jersey, and the International Harvester Corporation. The former did the domestic business, the latter the foreign business and some "new lines." The corporation sustained heavy losses in Europe through the war, and the two companies were re-combined in 1919, in time for the New Jersey Company's reserves to help to meet the corporation's losses.

Like the National Lead Company, the International Harvester Company met with no sympathy from the Bureau of Internal Revenue, and was required to file returns and pay taxes upon profits computed on the usual basis. The company's officers nevertheless expressed satisfaction with their experience, and said that they would do the same thing again in like circumstances. The adverse arguments of the bureau are stated in the following paragraph:

> Valuation on "base-stock" method: The base-stock method of taking inventory is not warranted by the law or regulations. According to this method, a manufacturer or dealer values at the same price year after year the minimum quantity of goods which he must have on hand at all times. It did not appear that this method had had any considerable recognition as the best accounting practice, but on the contrary, it was evident that it had not been widely adopted. A taxpayer who values his inventory at cost and who retains identifiable goods year after year may attain the results with respect to such identifiable goods which would be attained through the use of the base-stock inventory method. Goods which have been so intermingled that they can not be identified with specific invoices must, however, be deemed to be the goods most recently purchased because, in the absence of evidence as to the actual facts, this presumption is more nearly true than any other.—Adv. Bd. rec. 65, 1 C. B. 51.

The reports of the International Harvester Company contain the full certificates of public accountants, including specific explanation of the mode of valuing the inventories.

UNITED STATES STEEL CORPORATION

The United States Steel Corporation arrives at substantially the same results by a somewhat different process. Its reports are remarkable for their clarity and completeness; in the matter under discussion they may be distinguished from the two cases previously mentioned in that, while avoiding the valuation of inventories at inflated prices, the exact effect of the adjustment may be seen, and the balance sheet and income statement adjusted to a cost or market basis if the reader so desires. In the case of the National Lead Company an approximation to this basis may be made, but not an exact adjustment; while any attempt to recompute the International Harvester Company's position would be still more of an estimate. Morever, both the balance sheet and the income statement of the steel corporation are certified on their face by public accountants, in addition to the complete certification shown on another page, which clearly states the scope of the audit, In the 1916 report the detailed inventory schedule shows $13,500,000 deducted as "reserve for amount of actual cost or market value of stocks in excess of normal prices therefor." In the balance sheet only the net figure, after deducting this reserve, is shown; in the condensed profit and loss statement the reserve is deducted as a special adjustment. The certificate of the auditors states that "an adequate reserve has been made in respect of all abnormal values."

In 1917 this reserve became $30,000,000, in 1918, $51,000,000, and in 1919, $90,000,000. At this point the certificate discontinued the term "abnormal values" and stated that "a substantial reserve has been deducted from the values so determined," that is, at "approximate cost." In 1920 the reserve grew to $95,000,000, still reported in the same way, and it was stated that this represented the excess of unit prices over similar prices at the close of 1915. In 1921 the reserve was reduced to $61,000,000, and it was then described as being "set aside from earnings of previous years to absorb deflation in valuation in war period prices which may from time to time develop in respect to inventory items." In 1922 the reserve was reduced to $50,000,000, and remains at approximately that figure in the last annual statement.

It is clear, therefore, that the balance sheet might be adjusted by any interested person, by adding the stated amount of the reserve to the balance sheet inventory figure and to the surplus. The income statement of any year might also be adjusted by adding to the net profits shown the change in the inventory reserve for that year. The only point on which we are not informed by the reports is whether or not the company's published income figures were accepted by the internal-revenue bureau.

CONCLUSIONS

The net effect of these three company studies is the indication that business men of the highest standing felt it necessary, in a period of inflation, to depart from the customary cost or market method of valuing inventory, and to reserve against such part of the increased value as they believed could not be permanent. What is more, accountants of the highest standing have certified these statements. The practice is at variance with the common accounting rule and is disapproved by the internal-revenue department. Accountants may, however, very well consider whether they can not better adapt their rules to the requirements of sound business, while so presenting the facts that the situation is perfectly clear to the reader. The basic method described above was permitted by the income-tax authorities in England, largely because of their practice of averaging the profits of three years for the purpose of computing the taxable income. It may be that in due time our own internal-revenue bureau will become somewhat more elastic in this respect.

The suggestion that a minimum or normal inventory is a fixed investment of the same character as plant assets is ingenious, but not fully convincing. As the internal-revenue decision points out, there is a fundamental difference, in that the specific goods of the inventory are sold and replaced between annual reports, whereas the identical plant assets are retained. The bureau's suggestion that the identical goods of an inventory might be carried forward from year to year, and a company thus realize the benefits of the "normal inventory" method, is obviously futile. The question is one of broad business policy, and is not to be answered on a basis of simple arithmetic of this sort.

As in so many accounting difficulties, the real question is as to the period which should be covered by an income statement, in order to show truly the earnings of a business. If it be supposed that a period of inflation lasted for five years, at the end of which prices were at the same level as at the beginning, a single income statement covering the entire period would include no profit or loss arising from inventory changes; its income would come solely from selling goods for more than they cost. Interim income statements would, on the contrary, contain extra profits during the period of rising prices, with equal losses during the fall; the total net profits would be the same. But that does not mean that one can simply wait for time to iron things out; at any one point it is not known how soon, or to what extent, rises in prices will be reversed. Apart from tax considerations, the published reports should give the best possible guidance to stockholders who are thinking of selling their holdings during the fluctuations. Any computations as to the true net worth of a corporation, the value of its capital stock and its current ratios are certainly more enlightening when made upon information as given in the reports of the United States Steel Corporation than they are if "cost or market" inventories alone are available. The net effect of the former presentation is that cost or market values are given for those who desire them, but a more permanent valuation is added, and is preferred. The one essential thing is that any departure from custom should be fully explained, and its effect indicated precisely, in order that no one may be misled in the intermediate stages.

7. Miller Brush Company

INVENTORY ACCOUNTING: WHAT METHOD OF ACCOUNTING FOR INVENTORY IS BEST DURING AN UNSETTLED INDUSTRIAL PERIOD?

The Miller Brush Company was organized in 1877 to manufacture a complete assortment of brushes, from bristles purchased from Russia, China, and France. The Russian bristles were cheaper but were received in a very dirty condition and unsorted, which necessitated washing, combing, and sorting before they could be used as a raw material. The Chinese bristles were received in a cleaner condition, and while sorted as to size, each purchase consisted of various sizes at a lot price. The French bristles, which were used for special brushes, were received in cases containing one size only and in condition for immediate use. Russian bristles were white, yellow, or gray, while Chinese bristles were black. The weight of bristles influenced inventory figures because the bristles absorbed moisture during parts of the year and dried out during other periods. No humidifying system was used. The Miller Brush Company continued receiving its bristles from these sources until 1914, when, because of the European war, the Russian supply was cut off, which confronted the company with the problem of using the black Chinese bristles instead of the white, yellow, or gray bristles. This was likely to influence adversely their customers' preference for Miller brushes, thereby causing an accumulation of inventory. In addition, the market prices became irregular, and exchange rates fluctuated.

During the war the prices rose but presented no serious inventory problems, as the policy of pricing the inventory at "cost or market, whichever was lower," was followed. After the war, the market declined heavily, and the policy of pricing the inventory at "cost or market, whichever was lower," which the company had been using, was not satisfactory, because of the wide variations in market prices and because the market prices were not easily ascertainable on some items. The downward tendency was so great in some cases that costs had no relation to value at the time of inventory taking.

One method of accounting for inventory which was considered was that of retaining the actual cost figures throughout but to establish a reserve for inventory fluctuations which could take care of the decline in price of bristles. This method of inventory accounting was used by many firms during the war and gave satisfactory results. The executives of the Miller Brush Company, however, were of the opinion that their case differed from most of the other industries in that it was almost certain that the price of Chinese bristles would not increase at a later date. In most of the other industries where the cost method was used, it was expected that prices would rise after the post-war adjustment.

There was at all times a current market price at which the company, as a large importer, could sell its bristles in this country, and so the company's controller believed that the soundest method under the circumstances would be to price the inventory at these market prices.

A public accountant, with whom the Miller Company consulted, suggested that the company might use a standard cost which could be changed from time to time as the circumstances warranted. The company had never used a standard cost, chiefly because several members of the accounting department had contended that under the given circumstances this method had the same objection that the "cost or market" plan had. It was argued that a representative standard was impossible of establishment because of the changes in prices, and to present a true picture on the balance sheet some sort of allowance or reserve would have to be set up to take care of the difference between standard and actual in so far as the latter could be ascertained. This being the case, it was the opinion of some that as between standard cost and other methods possible, the cost method with an allowance or reserve for inventory fluctuations would prove to be satisfactory.

After the Miller Brush Company had followed a definite practice relative to balance sheet items with which its stockholders and other interested parties were familiar, should it contemplate any drastic changes in that policy?

Should any company faced with circumstances similar to the Miller Brush Company change its accounting policy with respect to an item during a period of rapid price fluctuations?

Did the company have any other alternatives that it might have chosen to meet its needs under the particular situation?

If you had been an executive of the Miller Brush Company what would you have instructed the accounting department to do in this case?

How would you price individual sizes of bristles purchased in a lot shipment at a lot price, both for inventory purposes and for cost accounting purposes?

8. URAL MILLS, INCORPORATED

INVENTORY VALUATION: UNDER WHAT CIRCUMSTANCES IS THE BASIC METHOD OF INVENTORY VALUATION APPLICABLE?

The Ural Mills were spinners of cotton yarns and makers of fabrics, mostly of high-grade qualities. Its monthly inventories the year round averaged $5,000,000, though the figures varied greatly at different times of the year. Cotton market fluctuations, therefore, reflected in the value of the inventories, frequently made material differences in the net monthly figure of profit or loss, and the adjustments involved in inventory valuation, both by reason of their amount and the difficulty of computing them, called frequent attention to this subject. Towards the end of 1928, therefore, during one of the frequent discussions of the matter, it was suggested that their difficulties might to a considerable extent be removed by the adoption of the basic or normal stock method of inventory valuation, which has been practiced by a number of companies. Among other reasons for this suggestion was the fact that the annual closing came in December, when the company usually had a very large stock in preparation for the Spring trade, but when market quotations for cotton were apt to be lower than average. It was, therefore, felt that the annual published balance sheet of the company tended to represent the company in its more unfavorable periods, both as regards its current position and also as to its profit earning capacity, if the usual cost or market rule for inventory valuation were applied. Some of the officials believed that these circumstances might be relieved by the adoption of the basic method, and that the cost accounting procedure of the company also might perhaps be simplified by this step.

Upon reflection, however, and after consultation with others, certain objections appeared which eventually made the step seem undesirable. The basic method was not intended to run contra to the usual rule of "cost or market, whichever was the lower"; that is to say, under no circumstances was it expected that the basic valuation would give a higher figure than the cost or market method, but that the former would always be the lower. In fact, the essence of the method, and the purpose for which it was devised, required that the inventories be valued at a lower figure than usual in order that something in the nature of a secret reserve might be created as a means of equalizing profits over a series of years. The method was, therefore, especially applicable during periods of inflation when prudence suggested the advisability of not showing all the apparent profits nor all the apparent assets, thus avoiding severe losses when subsequent declines in market prices should occur. These factors were not present in the case of the Ural Mills; their profits were somewhat less, rather than higher, than normal, and there was no advantage in taking the substantial initial loss which would be involved in writing down the inventory at the time the plan was instituted; the directors wanted to improve the showing of the company rather than make it appear worse. As to cost accounting, it was pointed out that the method would not necessarily require any change in the practices which had hitherto prevailed; inventories would continue to be kept in detail at cost prices and charged into production on the same basis as heretofore; the necessary modification would be made by setting up a reserve on inventory account which would from time to time show the amount by which it was desired to write down the inventory under the basic method. In other words, the device was wholly a matter of financial administration, the effect of which would be reflected in the balance sheets and income statements of the company, but not in its detailed accounting records.

Upon consideration of these factors the company abandoned the proposal for using the basic inventory method, but the inquiries made in connection with it resulted in directing attention to another matter which did seem susceptible of handling, namely, the question of the date for closing the fiscal year. The company's current ratio and showing of profits would in general be somewhat improved if the books were closed every year on August 31 instead of December 31. Such a case would be more in accord with ideas as to what constitutes the "natural business year."[1] The officers accordingly next proceeded to make a study of what would be involved in a change of this sort.

What accounting procedure would you recommend in this case?

9. Paulownia Chemical Company

INVENTORY VALUATION: HOW SHOULD INVENTORY BE VALUED WHEN THERE IS NO FREE MARKET?

The Paulownia Chemical Company imported its principal raw materials from several European and Central American countries, these raw materials being by-products of certain fruit industries. They were, therefore, available only in somewhat limited supply, and at certain seasons of the year. The Paulownia Chemical Company, on the other hand, produced goods which were in demand all the year round, and for production reasons also found it expedient to follow a fairly regular and even production schedule. An additional factor was that various lots of the materials contained widely different percentages of net purity content, and economy in manufacturing required a considerable degree of care and skill in combining various grades and qualities of materials. The united effect of all these circumstances was to necessitate the Paulownia Chemical Company's keeping a very large inventory, valued in the neighborhood of $1,500,000, and equivalent to the manufacturing needs of approximately six to nine months.

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[1] *The Natural Business Year*, by Elija Watts Sells, A. W. Shaw Company.

The valuation placed on this inventory was often a subject of discussion between the controller of the company and its auditors. While no fundamental disagreement was expressed with the usual rule of "cost or market, whichever is the lower," it was felt that this rule scarcely applied to the circumstances surrounding the inventory of the Paulownia Chemical Company. The company was the principal importer of these materials into this country, and as such was a controlling factor in the determination of their price; if, at any time, the company wished to purchase hurriedly even a small fraction of its normal inventory, market prices would thereby be forced up far beyond the usual levels. Only by maintaining purchasing agencies in the countries of origin, by constantly adapting itself to the quantities and conditions of supply, and by carrying its large inventory, was the company able to acquire its raw materials at anything like a reasonable price. It was pointed out that the "cost or market" rule has in mind among other things that if prices have gone down, a competitor may purchase raw materials and sell them at prices which will compel an earlier purchaser at higher prices to take a loss. This condition can only arise, however, when the materials in question are in free supply; in this case neither the Paulownia Chemical Company itself nor any competitor could acquire a supply of these raw materials sufficient to entail a loss on the realization of their large inventory. The company had a fairly steady market for its products, at remunerative prices, and the possibility that any loss would be incurred in realizing the inventory was extremely remote. Still another factor was that the close of the company's fiscal year came during the off season for these materials; it would be difficult in the first place to obtain any reliable quotations for the goods, and in the second place any such quotations as might be obtained could not represent any considerable quantity of materials in actual supply.

For the reasons given it was agreed between the company and its auditors that the inventories of raw materials, work in process, and finished goods, so far as the raw material elements were concerned, should be valued at the cost prices to the company.

Was the company justified in thus departing from the usual rule of "cost or market, whichever is lower," in the valuation of its inventory?

10. CLEMENTS MANUFACTURING COMPANY

INVENTORY CONTROL: HOW MAY A RIGID CONTROL OF INVENTORY BE BEST ACCOMPLISHED?

A very large number of products made the inventory problem of the Clements Manufacturing Company both difficult and important; a further complication was that new products were constantly being developed. It was more than ordinarily necessary for the company to keep its inventory down, both to avoid losses on realization, and also to save the expenses of holding and handling the inventories.

All manufacturing orders were for stock, and sales were delivered mostly from local warehouses. Two special features were therefore developed in the organization; the president appointed an inventory manager to have general supervision of all stocks, raw, process, and finished; and the warehouses constituted a separate department, independent of manufacturing or sales departments, under a manager whose acts were subject only to revision by the inventory manager. The warehouse manager tabulated the various classes of orders and prepared requisitions accordingly; a manufacturing schedule was then constructed to indicate how many of each item to make, under the following heads:

Item	Warehouse Requirements	Manufacturing Schedule	Sales Value

The second column represented the requisitions of the warehouse manager, as approved by the inventory manager; the third column was usually filled in with the same quantities, unless the warehouse requirements did not constitute an economical manufacturing run, when the production department would propose suitable quantities. At the end of the month the actual factory deliveries were added on the same sheet.

Some products made by the company, such as rifles and shotguns, took a long time for manufacturing completion; for these, therefore, a six months' schedule was prepared, and the monthly statements were based on it, in so far as they related to these items.

Material burden expense was watched closely; it included all direct costs of operating the raw material stores, as well as some prorated charges, such as for the cost department, and amounted to about 5% of raw material costs. It was therefore segregated and applied as a separate burden rate, charged as a percentage of direct materials used; for this purpose there were 10 different classes of materials, each with its own rate. One reason for doing this was the very different constitution of the costs of different products; guns, for example, were 80% direct labor, whereas cartridges were 80% raw materials; to apply the same burden rates on all such products would not be satisfactory. The stores themselves were classified according to the manufacturing departments which used them. Inward freight costs were charged to materials as they went into stores; the material burden rate was charged when the materials were issued from stores to process.

When the inventory manager was first appointed, he was confronted with a good deal of frozen inventory, accumulated during a period of attempts to force sales. While devoting effort to dispose of these, he also scrutinized all purchase requisitions to assure himself that they were necessary for production, and would not aggravate the existing inventory situation. Copper and lead were the two main raw materials, and on these the company sought to buy at times when prices seemed most favorable; all other materials and supplies were bought strictly according to the inventory schedule, with its maximum, minimum, and quantity to order. This entire schedule was worked out under the supervision of the inventory manager, after the old inventory situation had been cleared up. The latter process took a considerable time; raw materials not wanted were either returned to the vendors or else sold to other manufacturers in the city; in the case of finished goods it was necessary to make sales which would dispose of the goods. Work-in-process estimates were made as to the cost of completing the goods, and if it appeared that the additional cost could not be recovered in sales, the goods were either sold in their present condition or were scrapped.

It then became the business of the inventory manager to see that such a situation did not recur. Sales estimates were carefully prepared, and production schedules were based closely upon them. New lines were added only after careful consideration by a Merchandise Committee, consisting of the president, the sales director, and the production manager. Attention was given also to the possibilities of standardization, and reduction in the number of designs; in some lines, such as cutlery, it was possible to do a good deal in this direction; in others, such as fishing tackle, it was found necessary to follow the vagaries of the users.

Were the steps taken the most effective for the purpose of controlling and reducing inventories?

Do you approve the method of handling material burden in this case?

B. PURCHASING DEPARTMENT

1. Atterbridge Company

METHODS OF PURCHASING: WHAT PURCHASING METHODS ARE SATISFACTORY FOR A SMALL COMPANY?

The consultants whom the Atterbridge Company had called in to study its business, in reviewing the buying methods in use, found that purchases were made by any one of three people, who received Purchase requisitions from the various departments. This condition had resulted in duplication of purchases, as one person did not know what another had ordered, and no system was used for checking the supplies that had been ordered. Purchases of paper and board stock were made by two executives whenever they felt an additional supply was required, and, as a result, the company was often out of some varieties and overstocked on others. This disorganization of the purchasing procedure had developed but a short time before and was due to the conditions existing in the firm; the procedure which was supposed to be followed was not regularly and carefully adhered to in practice. The Purchase Requisitions (Form 1) were to be made out in duplicate by the foremen in the different departments, the original to be sent to the purchasing agent and the duplicate held by the foreman. In the office, the Purchase Order (Form 2) was made out in triplicate, the original sent to the vendor, the duplicate filed alphabetically in the pur-

PURCHASE REQUISITION

Date No.

To Purchasing Agent:

Please Order the Following

Quantity Wanted	Description	Reason for Ordering
		Bal. on Hand

Charge to Date Wanted Deliver to

ORDER PLACED

Date Number

Vendor

Planning Dept.

Approved

Purchasing Agent

Atterbridge Co.

FORM 1.

PURCHASE ORDER

To

Order No.

Req. No.

Please Enter Our Order for the Following:

Quantity	Description	Price
		F.O.B. Terms

Wanted

Ship via

Purchasing Agent

If shipment cannot be made on above date, *advise us at once*, and give us date of shipment.

NOTICE: Our Order No. must appear on invoice, goods, and all correspondence relating thereto. Do not fill this order at higher prices than last quoted or charged, without our authorization. No charges allowed for boxing or cartage.

Atterbridge Co.

FORM 2.

chasing office, and the triplicate sent to the receiving department, where it was held in an alphabetical file until the goods were received. Any correspondence or telephone messages relative to an order were noted on this copy in the purchasing office.

On receipt of the goods, the copy of the Purchasing Order kept in the receiving department was marked as filled and put in a permanent purchase file. A receiving report was then made out and sent to the accounting department.

The purchase invoices, when received by the accounting department, were sent to the purchasing agent for approval. Under conditions which existed they sometimes had to be sent to other parties who had actually purchased the goods.

A special Purchase Order was made out by the shop superintendent when small supplies were required by the factory, and if they were wanted immediately someone was sent down town to get them. When the invoices for these purchases were received the accounting department referred to the tissue copy of the order which remained in the special purchase book for their approval.

As an aid in purchasing, two card files were maintained in the purchasing department. The first was a quotation file with a card for each major kind of stock purchased, giving the date of each quotation received, the name of the vendor making the article and the quantity and the price. The second was a price record of all purchases made, a separate card being kept for each kind of material or supplies, on which were recorded the vendor's name, date of purchase, any special description, and the unit price. This file was used to check prices on new orders and also for pricing inventories.

In reviewing the purchasing procedure the consultants made several recommendations which they felt would aid in the systematic operation of the company. They stressed the point that all purchases should be made by the purchasing agent; other officials might interview salesmen in order to determine just what they wanted, but the final order should be placed through the regular channels. Under the existing system, requisitions from the foremen were sent direct to the purchasing agent; it was suggested that a change be made, and that all requisitions be approved by the shop superintendent before being forwarded to the purchasing agent, so that he could revise or cancel them if he thought best. Further, it was recommended that the superintendent himself order all paper and board stock required and that he be held responsible for keeping a proper supply on hand. They also believed that it would be advantageous to have the requisitions approved by the general manager before orders were finally placed. For small items he might issue a blanket approval if he did not consider it necessary to check each one.

To eliminate some clerical work it was thought that the copy of the Purchase Order going to the receiving department could be redrafted so that it could also be used as the receiving record and returned as such to the accounting department. It could then be filed permanently with the Purchase invoices received and thus give complete details of an order. If this change were made it was suggested that a record be kept in the receiving department similar to a day book in which would be listed the date, quantity, vendor's name, and description of all goods received.

Do you consider that the plan presented by the consultants offered ample purchasing control for this company?

What do you think of the plan of redrafting Purchase Orders to be used as permanent records?

2. Novelty Cotton Mills

COTTON PURCHASES: WHAT FORMS OF HEDGING AFFORD PROTECTION TO A MANUFACTURER OF DIFFERENT LINES OF COTTON GOODS?

The Novelty Cotton Mills manufactured two distinct lines of goods, which were sold under very different conditions. The first class of goods included specialty articles made from cotton cloth and offered to the trade on a price list which was revised at intervals during the year. There was a fair margin of profit on these goods, and selling prices did not follow raw cotton prices as closely as did the selling prices of the second line of goods. The latter consisted of staple lines of cheap cotton cloth, made for quick delivery at prices which closely followed the fluctuations of the cotton market from day to day. The company believed, therefore, that it was desirable to obtain its cotton for these two lines, and protect itself from market fluctuations, by different policies.

HEDGING OF SPECIALTY GOODS

The specialty goods were manufactured continuously through the year and, to supply the mill's requirements, the company had an arrangement with a merchant whereby the latter was to deliver 100 bales of cotton weekly, of a suitable grade, and invoiced at the market prices for spot cotton on the day of shipment, plus "basis."[1] The basis varied somewhat from time to time, but averaged about 1.40 cents on—that is, extra to the spot price quoted. It depended on many conditions in the market, and on the difficulty of securing the particular grade desired. Neither the spot price itself nor the basis could be exactly known until the actual day of shipment arrived, but relations between the mill and the merchant were of long standing, and had always been very satisfactory; the mill had therefore no anxiety about not receiving fair treatment.

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[1] "Basis" is a small margin added to or subtracted from the base price of cotton quoted in the market, which price is for the base grade, or middling. The basis is supposed to cover delivery expenses, and also an allowance for variations in the actual grade from the base grade; but it has come to be in effect the merchant's trading margin, out of which he adjusts his prices to market conditions, defrays such costs as may be involved, and makes his profit.

In January, 1928, spot cotton was about 20 cents, and, allowing a basis of 1.50 cents, a price list on the specialty goods was prepared on the assumption of a cost of 21.50 cents for cotton. It was then desired to obtain protection against fluctuations from this price, and, to do this, futures[1] were bought during January to cover the cotton required for four months' sales, estimated at 2,000 bales. It was arranged with the cotton merchant to wire the mill's brokers, on the day of each shipment of cotton to the mill, to sell or close an equal quantity of the mill's long futures. The anticipated effect of this was to offset losses or gains on the spot cotton actually delivered, with approximately corresponding gains or losses on the futures. The way in which this worked out is illustrated in Table 1. It is seen there that the spot price on the first shipment of March 4 was 18.95 cents, or 1.05 cents below the standard price previously set; this gain, however, was offset by a loss of 1.26 cents on closing out the corresponding futures. The same thing occurred on all the first six shipments, but thereafter the reverse situation took place, and losses on spot cotton were made good by gains on futures. These offsetting losses and gains never balanced each other exactly, however, because there was not perfect correlation between spot and futures prices; moreover the prices of futures for different months varied. In this case the futures were bought for July and October delivery, because those were active trading months, for which it was therefore easy to make and close out contracts; the actual deliveries of cotton, however, extended from March 4 to July 15. The net result of the series was that the mill secured its cotton at an average cost of 21.25 cents,

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[1] This word "futures" is the abbreviation of the original term "Contracts for the Future Delivery of Cotton." The word is never used except in connection with dealings in future contracts upon the three organized exchanges, namely: New York, New Orleans, and Liverpool (HUBBARD: *Cotton and the Cotton Market,* p. 209).

TABLE I

HEDGING TRANSACTIONS FOR SPECIALTY GOODS

FUTURES BOUGHT IN JANUARY			RECEIPT OF COTTON								
DELIVERY					INVOICED PRICE			FUTURE MARKET DAY OF SHIPMENT			
Bales (A)	Month (B)	Price (C)	Invoice Date (D)	Bales (E)	Spot Market Day of Shipment (F)	Basis (On) (G)	Total (H)	Month (I)	Price (J)	(J − C) Profit Loss on Futures (K)	(H + K or − K) Total or Net Cost of Cotton (L)
		(Cents)			*(Cents)*	*(Cents)*	*(Cents)*		*(Cents)*	*(Cents)*	*(Cents)*
1,000	July	19.82	Mar. 4	100	18.95	1.38	20.33	July	18.56	1.26*	21.59
1,000	October	19.24	Mar. 12	100	19.00	1.38	20.38	July	18.50	1.32*	21.70
			Mar. 19	100	19.45	1.39	20.84	July	18.99	.83*	21.67
			Mar. 25	100	20.00	1.40	21.40	July	19.49	.33*	21.73
			Apr. 2	100	19.95	1.37	21.32	July	19.33	.49*	21.81
			Apr. 8	100	20.30	1.37	21.67	July	19.71	.11*	21.78
			Apr. 15	100	20.35	1.37	21.72	July	19.89	.07	21.65
			Apr. 20	100	20.45	1.39	21.84	July	20.01	.19	21.65
			Apr. 29	100	22.15	1.39	23.54	July	21.49	1.67	21.87
			May 7	100	21.95	1.40	23.35	July	21.25	1.43	21.92
			May 15	100	21.75	1.40	23.15	October	20.99	1.75	21.40
			May 20	100	21.55	1.40	22.95	October	21.18	1.94	21.01
			May 28	100	21.05	1.42	22.47	October	20.96	1.72	20.75
			June 3	100	21.35	1.42	22.77	October	21.21	1.97	20.80
			June 11	100	20.95	1.42	22.37	October	20.76	1.52	20.85
			June 19	100	21.25	1.40	22.65	October	20.89	1.65	21.00
			June 24	100	22.05	1.40	23.45	October	22.08	2.84	20.61
			July 1	100	22.80	1.38	24.18	October	22.64	3.40	20.78
			July 8	100	21.95	1.38	23.33	October	22.54	3.30	20.03
			July 15	100	21.60	1.38	22.98	October	21.75	2.51	20.47
										Average	21.25

*Loss.

against the 21.50 cents it had counted on. On a rising market the company was able to offer goods on its adopted price list until the equivalent of 2,000 bales of cotton had been sold. It was not necessary to change the price list for minor declines in the market, but a considerable and sustained drop might call for a revision of the price list downward in order to dispose of the 2,000 bales set as a quota.

PROTECTION OF PURCHASES FOR STAPLE LINE

In the case of the staple cloth sold for quick delivery, the smaller margin necessitated a more rigid protective policy. It was necessary to make the goods in anticipation of sales, and to buy cotton for the mill's requirements before it was known what could be realized from the finished goods. For this purpose, protection was secured by buying cotton on call; by this means cotton was secured to meet the mill's operating schedule, with the understanding that prices were to be fixed at market within a specified time limit.

When cotton was shipped to the mill the merchant invoiced them at provisional prices, representing the market on the day of shipment. These prices were subject to adjustment later, when sales of finished goods were made by the mill; at that time the mill requested the merchant to fix a price on the equivalent amount of cotton, which he did in multiples of 100 bales to the quantity nearest the number of bales sold. The operation of this plant is illustrated in Table 2; in the left-hand section, call purchases are listed at the stated prices "on" the prices quoted for the various months. When 100 bales were delivered on July 3, a provisional price of 22.36 cents market, plus 1.35 cents basis, was charged to the mill; but when on September 8, 78 bales of cotton goods were sold, the merchant was asked to fix a price on 100 bales, that price was fixed, according to the market on that day, at 21.05 cents, or 1.31 cents less than the invoiced price. This reduction of 1.31 cents constituted therefore an allowance to the mill, but the basis still remained in the hands of the merchant, making a net price to the mill of 22.40 cents.

The real significance of this arrangement was that the merchant assumed the risks, by charging the mill only at market

Table 2

Purchases on Call for Staple Goods

Call Purchases Orders Placed with Merchant					Receipts of Cotton					Week Ended	Equivalent Bales Cotton	Prices Secured for Cotton in Goods Sold*	Date	Bales and Month	Market Price	(G − O) Adjustment with Merchant Paid or Received†	(O + H) Total Cost of Cotton Including Basis
Date	Bales	Delivery		Price	Date	Bales	Provisional Price										
(A)	(B)	(C) Bales Weekly	Beginning	(D)	(E)	(F)	(G) Market	(H) Basis	(I) Total	(J)	(K)	(L)	(M)	(N)	(O)	(P)	(Q)
				(*Cents*)			(*Cents*)	(*Cents*)	(*Cents*)			(*Cents*)			(*Cents*)		(*Cents*)
June 15	400	100	July	1.35 on Oct.	July 3	100	22.36	1.35	23.71	Sept. 8	78	22.60	Sept. 8	100 Oct.	21.05	1.31†	22.40
July 17	400	100	Aug.	1.40 on Oct.	“ 9	100	22.30	1.35	23.65	“ 15	92	21.77	“ 15	100 “	19.79	2.51†	21.14
Aug. 16	400	100	Sept.	1.38 on Dec.	“ 15	100	21.28	1.35	22.63	“ 22	115	21.62	“ 22	100 “	19.79	1.49†	21.14
Sept. 12	400	100	Oct.	1.34 on Dec.	“ 24	100	20.65	1.35	22.00	“ 29	102	21.60	“ 24	100 “	19.79	.86†	21.14
Oct. 19	400	100	Nov.	1.38 on Mar.	Aug. 1	100	20.55	1.40	21.95	Oct. 6	121	20.70	Oct. 6	100 “	19.04	1.51†	20.44
					“ 9	100	20.56	1.40	21.96	“ 13	96	20.97	“ 13	100 “	19.23	1.33†	20.63
					“ 16	100	20.62	1.40	22.02	“ 20	85	20.60	“ 20	100 “	18.98	1.64†	20.38
					“ 22	100	20.95	1.40	22.35	“ 27	105	20.22	“ 25	100 “	18.33	2.62†	19.73
					“ 30	100	21.36	1.38	22.74	Nov. 3	112	20.35	Nov. 3	100 Dec.	18.39	2.97†	19.77
					Sept. 7	100	20.63	1.38	22.01	“ 10	110	20.13	“ 10	100 “	18.48	2.15†	19.86
					“ 14	100	21.05	1.38	22.43	“ 17	106	19.90	“ 17	100 “	17.89	3.16†	19.27
					“ 20	100	19.79	1.38	21.17	“ 24	92	19.83	“ 24	100 “	17.96	1.83†	19.34
					“ 28	100	19.79	1.34	21.13	Dec. 1	90	19.14	Dec. 1	100 “	17.17	2.62†	18.51
					Oct. 4	100	19.27	1.34	20.61	“ 8	93	20.06	“ 8	100 “	17.93	1.34†	19.27
					“ 10	100	19.04	1.34	20.38	“ 15	106	20.56	“ 15	100 “	18.74	.30†	20.08
					“ 18	100	19.23	1.34	20.57	“ 22	109	20.96	“ 22	100 “	18.95	.28†	20.29
					“ 26	100	18.98	1.38	20.36	“ 29	120	21.23	“ 29	100 Mar.	19.40	.42	20.78
					Nov. 2	100	18.33	1.38	19.71	Jan. 5	92	21.25	Jan. 5	100 “	19.42	1.09	20.80
					“ 10	100	18.39	1.38	19.77	“ 12	106	21.29	“ 12	100 “	19.50	1.11	20.88
					“ 16	100	18.48	1.38	19.86	“ 17	102	21.27	“ 17	100 “	19.48	1.00	20.86
										Average per pound		20.79			Average per pound		20.34

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* This is the average cotton price including estimated basis on which the prices of goods sold during the week were based.

† Received.

prices on the day of the mill's sales. The merchant of course was able to do this because he himself was hedging his own transactions; moreover, he made something on the basis. As for the mill, call cotton was always owned at the market from day to day; the cost for manufacturing purposes was the market price at that time, and the cotton was self-hedging.

If this plan could have been carried out in its entirety, purchases of cotton would be made only against sales, and there would have been very little in the way of discrepancy; but a number of circumstances prevented a perfect working of the plan.

TABLE 3

COTTON POSITION

AS AT SEPTEMBER 28, 1928

COTTON BOUGHT FOR PRICE-LIST GOODS

(*Price list issued in June based on cotton cost of* 22.00 *cents and* 2,600 *bales October, December, and March futures purchased.*)

	BALES	COST		MARKET	
	(500 lb. Each)	Per Pound	Total	Per Pound	Total
		(*Cents*)		(*Cents*)	
Futures bought in June (open at this date):					
October	700	22.14	$ 77,490.00	20.48	$ 71,680.00
December	600	21.97	65,910.00	20.45	61,350.00
March	200	21.84	21,840.00	20.29	20,290.00
Cotton on hand (in bales, in process and in finished goods):					
Bought for old price list (sold but not yet delivered)	252	21.25	26,775.00	21.25 (Spot)	26,775.00
Bought for new price list	625	21.78	68,062.50	20.70	64,687.50
Total on Hand and Futures	2,377	21.96*	$260,077.50	20.52*	$244,782.50
Cotton required for unfilled orders:					
Old price list	252	21.25	$ 26,775.00	21.25	$ 26,775.00
New price list	1,218	21.96	133,736.40	20.52	124,966.80
	1,470		$160,511.40		$151,741.80
Net long position (representing balance of 2,300 bales provided for new price list unsold at this date—2,600 bales were provided but 300 bales were used for goods oversold and shipped on old price list)	907	21.96	$ 99,588.60	20.53	$ 93,103.55

NOTES: (A) Disadvantage on today's market $6,485.05. If it becomes necessary to reduce price list before the 907 bales are sold loss cannot be avoided.

(B) Average basis of 1.40 cents on has been added to cost prices of futures and to all market prices for purposes of comparison with cost prices of cotton on hand.

* Average price exclusive of 252 bales bought for old price list at 21.25 cents.

Orders for goods on which prices of call cotton had been fixed sometimes were canceled by the mill's customers, leaving the mill with unsold fixed-price cotton on hand. At times when the market appeared to be favorable desirable lots of spot cotton were picked up, and prices were fixed on call cotton without reference to sales; conversely, goods were sold without immediately fixing price on the cotton required for their manufacture, if the mill hoped to get a better price later on. The estimated sales of price-list goods covered by buying futures were not always realized and sometimes were exceeded.

The two statements shown in Tables 3 and 4 of the mill's

TABLE 4

COTTON POSITION

AS AT SEPTEMBER 28, 1928

(*Exclusive of cotton bought for price-list sales*)

	BALES	COST		MARKET	
	(500 lbs. Each)	Per Pound	Total	Per Pound	Total
Cotton on order:		(*Cents*)		(*Cents*)	
Spot	200	19.00	$ 19,000.00	20.70	$ 20,700.00
On call (at 1.40 on December)	500	20.25	50,675.00	20.25	50,675.00
Cotton on hand (in bales, in process and in finished goods):				(Spot)	
Price fixed	1,212	22.35	135,441.00	20.70	125,442.00
On call:					
1.35 on October	200	20.48	20,480.00	20.48	20,480.00
1.42 on December	400	20.45	40,900.00	20.45	40,900.00
1.45 on March	400	20.39	40,780.00	20.39	40,780.00
Total Cotton on Order and on Hand	2,912		$307,276.00		$298,977.00
Deduct call cotton on order and on hand in bales, in process and in finished goods	1,500	(at prices shown above)	152,835.00	(at prices shown above)	152,835.00
Balance—Fixed Price Cotton	1,412	21.88	$154,441.00	20.70	$146,142.00
Deduct Cotton Content Required for Unfilled Orders	1,101	21.88	120,449.40	20.70	113,953.50
Balance Unsold—Long Position Gross	311	21.86	$ 33,991.60	20.70	$ 32,188.50
Futures sold in August to hedge the long position:					
October	200	22.14	$ 22,140.00	20.48	$ 20,480.00
December	100	21.97	10,985.00	20.45	10,225.00
	300	22.08	$ 33,125.00	20.47	$ 30,705.00
Net Long Position	11		$ 866.60		$ 1,483.50

NOTES: (A) Advantage on today's market $616.90.

(B) Average basis of 140 points on has been added to cost prices of futures, and to all market prices for spot or call cotton for purposes of comparison with cost prices of cotton on hand.

cotton position were therefore prepared weekly, for the purpose of showing that the cotton inventories and commitments of all sorts were in good order.

Should losses and gains on futures be closed out into the cost of cotton, as is done in Table 1? Would this always be the case?

Do you think that the form of hedging adopted in each case was appropriate?

Why was the mill not wholly protected against loss?

3. Libby and Barton

PURCHASING POLICY: HOW CAN PROFIT ON BUYING HIDES AND ON MANUFACTURING BE SEGREGATED?

Libby and Barton was a concern of tanners which had grown up with the industry in a small town on the Atlantic seaboard. It had from time to time during its history produced various types of leather, but of recent years the production had run chiefly to heavy sole leather. However, it still continued production on several lines of special leather for which it had a secret process. The firm had always kept its identity, never having combined in any way with a packing house or shoe concern. Partly for this reason and partly because of various agreements between other companies in the industry, the executives felt themselves, especially since the war, becoming more and more dependent upon raw material market conditions. This company was well located to purchase both domestic hides and those imported from South America and, thus, had some advantage in meeting the strenuous competition in the industry. The executives, however, felt that they should have more complete records to guide them in making commitments and to aid them in the analysis of costs.

Hides were a most difficult commodity to buy with any assurance of grade or quality because of the difficulty of standardization. Roughly, they were divided into three classifications, packers, city, and country, for both foreign and domestic hides, but beneath these classes, they must be still further divided according to the actual quality of the individual skin. Such things as the effect of diseases like anthrax and tick fever, grub holes, scratches and bruises, the sex, age, weight, and territorial origin of the animal had to be known to judge just how much leather of a given quality might be taken from a particular hide. According to the first classification, packers' hides were those removed from the carcass at large meat-packing companies. These were properly handled and therefore were likely to be more uniform in quality. City hides were those bought from city abattoirs and as a result of handling were considered second in reliability of quality to packers' hides, while those from the country, removed by farmers and unskilled butchers, were even less reliable. The price at which the various classes of hides were sold took quality into consideration roughly, but the quality variation within a class was large.

Not only did the executives of this concern find great difficulty in obtaining the exact quality they needed economically, but the rapid changes in price caused them unexpected upsets. It had not been unusual, since the war, for prices to change as much as 20% from month to month and 100% from one year to another. The supply of hides was only slightly dependent upon the demand for them, since they were a by-product and only available when cattle were killed for meat. The supply was even less reliable, because of the fact that most of the large packers, five of which supplied 85% of the best hides to the market, saw fit to supply their own tanneries in the event of a tight market before selling upon the open market. Such severe changes in price had at times of a rising market doubled and even trebled normal profits for this company, and at times of a declining market they had sometimes caused severe losses.

The manufacturing operations of tanning in this company consisted of many chemical treatments usually followed by a simple physical operation or so, and drying. The exact number of such processes depended entirely upon the grade and kind of leather being produced, and upon the manner in which the hide had been previously cured. The period of manufacture usually lasted as long as from six to eight months, and during this time the operations on the various batches of leather were so intermingled that finding the cost of each lot was most difficult. During the course of the hides through the plant, there was always danger that the workmen might spoil them. To avoid the prevalence of such occurrences, the management attempted to hire only men highly skilled in the trade and paid high wages for them; the labor cost, however, constituted only about 16% of the total cost of the finished leather, while hides alone accounted for 65% of the total manufacturing cost.

With the view of analyzing costs and aiding purchasing, a perpetual record was kept of all purchases so that the individual purchase kept its identity throughout the manufacturing process. Also a statistical record was kept not only of the price paid per pound, and the actual leather obtained from each order, but the locality from which the hides came, the number of defects per hide, the manner in which they were cured and in general this record showed the results of each purchase. Throughout the process, the hide cost and the other expenses of production were kept separate, the former being carried at cost in a Hides in Process account, and the other costs being carried in an account, Tanning in Process. The Tanning in Process account then showed all other costs of manufacture, but hides used. The Hides in Process account furnished the actual cost of hides in the leather coming out of process, which was compared with the prevailing price of similar hides at the time of the sale of the leather. The difference was considered the profit or loss on market fluctuations, and the remaining profit or loss was considered as resulting from manufacturing operations.

The executives felt that this system gave them sufficient control over both purchases and manufacturing operations. There were certain difficulties, they said, in testing the efficiency with which each order was handled because of the variation in size of lot, but this, they felt, would be taken care of when a sufficient number of records had been built up to insure a comparison with each order when it was finished.

How accurately do you think the above system would segregate profits on advantageous purchases from profits gained through manufacturing operations?

Would you have undertaken to segregate profits from the different sources in another manner than the method described here?

Considering the long period necessary to tan leather, did this means of differentiating between the two types of profit offer information of any particular value? What information might be wanted?

What advantages might there be in having such a statistical record of purchases on hand as the one here mentioned?

4. Kendrick Bag Company

FLUCTUATING MATERIAL PRICES: WHAT EFFECT MAY FLUCTUATIONS IN RAW-MATERIAL PRICES HAVE UPON MANAGERIAL POLICY?

In the manufacture of bags such as those used for grain, sugar, seeds, flour, vegetables, and fertilizers, the Kendrick Bag Company had occasion to use large quantities of cotton sheet goods and burlap. The cost of these fabrics to the company constituted as high as 85% of the total cost of the finished bags, the manufacturing process adding only about 15% to the value of the goods. By far the greater part of this company's business was done in the burlap line, which fact accentuated the difficult problem of purchasing.

For years, burlap prices had fluctuated so rapidly and widely that the profits of this company had depended almost entirely upon whether or not the purchases of raw materials were made at a favorable time, rather than upon the efficiency with which the manufacturing processes were operated. With this knowledge in mind, the management had, for the most part, let the production end of the business take care of itself and concentrated its energies upon purchasing correctly. As a result, the plant was operated with somewhat antiquated machinery and probably was inefficient as compared with what it might otherwise have been, although it was considered comparable with many of the best concerns in the industry.

The chief market for burlap was in Calcutta, and although it was under control of the British Government, it was unorganized. Speculators were permitted to function freely, and, as a consequence, they could force, temporarily, either a "bearish" or a "bullish" market, at will. This, added to the fact that burlap was made of jute, a vegetable product highly susceptible to weather conditions, and which therefore fluctuated in price from natural causes, forced a highly uncertain situation at all times. Merchants from the United States had little influence in this market, especially since the South American demand for burlap had grown so large in recent years, but all attempts to establish a market in New York had failed. Therefore, no opportunity for hedging purchases was possible which could safeguard a manufacturing profit for the concerns in this industry. Losses and gains on purchases had to be taken into consideration, and their size depended upon the ability of the purchasing agent to judge demand and supply and the various other uncontrollable factors. The problem at this company was still further complicated by the number of grades of burlap needed to meet the government shipping regulations for the various goods of its customers.

A few mills in the trade had purchased foreign plants in order to avoid some of the risks resulting from speculation, but they were thought to have been successful only to a minor degree in their endeavors. This company, however, was not in a financial position to take any such step. It might have contracted for the entire output of some foreign plant, but this was felt inadvisable, for the price would probably fluctuate about any contract price that could be made. By and large, it was thought best to leave matters in the hands of the purchasing agent.

The problem, so far as cotton grey goods were concerned, was not so great, although it did present itself in a lesser way. Even though hedging could not be carried on because of a lack of market for grey goods, the price did not fluctuate so greatly. Besides, it was considered a more simple task to estimate the conditions in the cotton market considering the quantities of statistics offered on that industry.

In this situation where rapid changes in price take place resulting to a great measure from speculation, how should inventories be carried? How might it affect the handling of stocks?

When raw materials play such an important part in determining profits what should the attitude be towards the manufacturing processes?

What means might the cost accountant offer for smoothing out this risk from year to year?

5. Murray Boot and Shoe Company—No. 1

PROGRAM OF PURCHASING: WHAT AID MAY COST ACCOUNTING RECORDS BE TO THE PURCHASING AGENT?

For years the Murray Boot and Shoe Company had made high quality boots and shoes for both men and women. Formerly, the production of this company had been confined to a limited line of standard shoes which were known for their quality, but recent changes in demand had necessitated a change in policy. Each season new styles and models were produced to please the consumers, and to a great extent the past year's styles were discarded as obsolete; in fact, it was not unusual for styles to be created and discarded within a single season. These newer styles not only differed in shape and structure from the older ones but contained a large assortment of leathers as well.

The increase in the number of items produced altered the manufacturing procedure of the entire company; its effects were seen in increased cost of sales, increased cost of designing, and in increased general overhead throughout the entire plant. Smaller lots were produced and had to be sent through with greater rapidity to meet the varying demands, and, except for a very few staple articles, it was impossible to manufacture for stock. A particularly important change occurred with respect to inventories and purchasing, in that the number of articles needed for production had increased; on the other hand, the amount of each individual type of leather needed at any one time had been reduced.

This company did not operate its own tannery, but purchased its leather in a hand-to-mouth manner upon the open market, wherever the most favorable price could be secured. For this reason the company secured greater flexibility in purchasing than would otherwise have been the case if it were forced to make commitments six or eight months in advance to allow for proper tanning of the hides. Nevertheless, the problem of economic purchasing was vital to the company.

Leather was the most important item of cost, comprising as high as 60% of the total manufacturing cost. The waste on this material varied greatly, depending upon the kind and quality of leather used and upon the type of shoe made, but as a rule not more than 45% of the leather ever got beyond the first cutting process. It was imperative, therefore, that the right grade and tan be procured for each section of the shoe, but there was difficulty in obtaining standard grades of leather, for each hide or skin was individual in size, shape, and condition. This condition was reflected in the cutting department, which showed a varying amount of waste. Tanners encountered a similar difficulty in buying raw hides, but some were more careful than others in re-grading the finished leather sold to the shoe manufacturers, although the quality of the individual pieces might differ considerably within any single lot of leather.

The company had ordinarily used both oak and hemlock tanned hides but had recently found that many of the chemically processed leathers gave fully as good results as those tanned by the natural barks; it still took, however, as much as six to eight months to tan the hides properly, even with the quicker chemical processes. Such a long period of manufacture had some effect upon the relation between hide and finished leather prices, but over a period of time they tended to keep in constant relation to each other. Over a two-year period, for example, when hide prices rose 50%, there was a corresponding increase in sole and upper leather prices. Prices of shoes, however, did not show any such increase, as they had to be established in advance for the entire season; in the meanwhile, leather prices might fluctuate widely. Ample and reliable data could always be secured concerning stocks of leather on hand, the number and grades of cattle coming into the market, and the trend of hide prices in foreign countries. Such data were an aid to buying, but the problem still remained of determining the sources from which to buy, and the type and volume of leather to purchase at any given time.

What records might the cost accountant offer as an aid to the purchasing agent of the Murray Boot and Shoe Company?

6. Narragansett Mills

SPECULATIVE PURCHASING: WHAT POLICY SHOULD A GREY GOODS MILL FOLLOW IN RESPECT TO PURCHASING

Since the wide fluctuations in raw cotton prices were sufficiently large to cause a large speculative gain or loss, depending upon the skill with which commitments were made, the executives of the Narragansett Mills had come to look at purchasing as the chief source of profits. In fact, the gains or losses on purchases were large enough to obliterate any purely manufacturing profit that might have been earned. As a rule, however, these mills had been extremely successful in purchasing cotton, relying, as they did, upon the skill of an agent who had been in that business for years and knew the market thoroughly. This man, however, was old and wished to retire from active work, which forced them to consider replacing him and to examine the problem of purchasing in general.

The executives realized that in the past their operations had been little more than pure speculation, but at the same time they had never let an opportunity pass to make their mills an efficient unit; their mills had, therefore, always been considered one of the low cost producers in the industry. With the resignation of the purchasing agent, they were confronted with the problem of deciding whether to avoid all risks of the market as far as possible and to concentrate their efforts upon manufacturing economies, or to attempt making the greater part of their gains through shrewd purchasing. An attempt was made to look at the question from a long time point of view.

Cotton prices were hard to forecast because of the large number of uncertain factors affecting both supply and demand. Since cotton was an annual agricultural product highly sensitive to climatic conditions the supply as a whole was unreliable, and the supply of a certain staple still more so, for the weather conditions determined to some degree the length of a fibre. Also, the cotton crop was always subject to the boll-weevil plague which, in years just previous to this time, had resulted in tremendous destruction. The demand for cotton by mills, particularly in the shorter staples which this company used, was highly erratic. Commitments were not only made at various times in the year by the mills of the industry, but also the amounts purchased differed a good deal from year to year.

It would have been impossible to make purchases only as orders for cloth were received and thus avoid all dangers of price fluctuations because, when the time came to purchase under such a plan, the staple needed might not be available. At any rate, the time elapsing between ordering and receiving the bales of cotton would have extended the manufacturing period too greatly. Therefore, as there was an organized market for cotton, three methods of purchasing were considered. First, it would be possible to continue the old policy of buying when the market seemed favorable; second, it would be possible to buy in a hand-to-mouth fashion, keeping only small stocks on hand at all times; or third, it would be possible to purchase in conjunction with a system of protective hedging.

None of these plans would have completely done away with the dangers of price change. Under the "hand-to-mouth" plan, some risk would still be present, especially as on very small orders of cotton the brokers' commissions were too high to make them economical. Also, the raw cotton costs amounted to two-thirds of the grey goods cost, and any variation in price would have an appreciable effect upon profits even for small quantities on hand. Such a plan would have reduced the carrying charges of the raw materials at the mill. On the whole, this plan would have materially reduced the risk.

The fact that raw cotton prices and grey goods prices did not fluctuate together prevented a pure hedge, as the Narragansett Mills sold grey goods and not cotton. To obtain a protective hedge, then, the procedure would have been to sell futures for an equivalent quantity when actual cotton was purchased, and to buy futures for an equivalent quantity whenever orders for cloth were received. If, during the interval, cotton prices declined, the value of cotton holdings would have diminished, but there would have been a gain in the future transactions, since in a declining market the futures could have been bought back at a lower price than that at which they had been sold. To have a hedge of this sort completely successful, there would have had to be a constant spread between the spot price (or the price at which the cotton was actually purchased) and the future. In the cotton market, however, this spread, as a result of such factors as the varying anticipations with respect to the size of the new crop, was usually not constant. Consequently, all dangers would not have been eliminated through hedging. It also would have required a good deal of expense in the way of commissions to carry on this procedure.

The executives of the Narragansett Mills had, available, past production records going back over many years of operation, including volume of production, raw material costs, grey goods prices, handling charges on cotton and all particulars pertaining to production in general and to raw materials. The company also had access to all information on past prices for cotton and quotations on futures.

In general, would you say a grey goods mill should speculate in raw materials, or should it attempt to avoid such risks as far as possible and make a purely manufacturing profit?

If this company should decide to follow a plan of the latter type, in determining whether it would be more economical to buy in a "hand-to-mouth manner" or to hedge, what information should be collected and how should it be presented to the executives to guide them in deciding between the two methods?

C. INCENTIVE WAGE PLANS

1. White Chemical Corporation

INCENTIVE WAGE SYSTEM: WHAT ITEMS SHOULD BE INCLUDED IN DEVELOPING A BONUS SYSTEM?

The White Chemical Corporation was located in the middle-eastern states and confined its production to a limited number of products which could be made on a large scale. The processes were carried on entirely by automatic machinery, and comparatively little direct labor was required in the factory. An important factor in the industry was the development of new machinery, which caused frequent changes to be made in the equipment of the plant.

With a view to increasing the efficiency of its operations and getting an outside opinion of the general situation in the company, the services of a firm of consulting engineers were secured. They were to study the activities of the company and render a report of what, in their opinion, could be done to improve existing conditions.

In presenting their report, the consulting firm outlined, as follows, what it considered to be the four basic essentials to any successful management:

1. Duties and responsibilities must be clearly outlined—i.e., good organization.
2. The results of organization must be adequately recorded.
3. Standards of performance must be established.
4. Rewards must be provided where the standards are beaten.

In the main, the consultants believed that the firm was well organized and that the cost and statistical department was doing an excellent job in the recording and preparation of cost data for the use of the executives. They did, however, recommend that standard costs be adopted and that new incentive methods be developed.

They pointed out that with standard costs the management would be informed each month as to the efficiency with which the different departments were operating, and that it would be possible, by analysis, to determine the exact reasons for any profit or loss shown from the standard figures. Such standards would serve also as the basis for the development of incentive methods.

The White Chemical Corporation had in operation a wage incentive plan based on the saving made in direct labor costs over a standard that had been set. In several departments, however, the plan had been suspended because of changes in processes and equipment which had brought about new conditions.

The consultants maintained that this system was not suited to the requirements of the firm. They pointed out that the direct labor cost of the product constituted on the average less than 5% of the total controllable cost, and, further, that in addition to the workers in the plant, the chemist was the only man to be included under the incentive system.

Under the plan which they suggested, every controllable cost would be included in the base on which the incentive system was founded, and the entire personnel of the plant having any connection with its operations would have a share in any bonus earned. This arrangement would establish a direct incentive to maintain at a high efficiency every factor over which it was possible to keep control. To illustrate this point, the matter of the yield obtained from the different processes was used; under existing conditions the bonus was reduced or canceled when the yield fell below a certain minimum. On the other hand, there was no incentive to keep the efficiency of the process at as high a level as possible, although the percentage of the yield obtained from materials entered into process was a very important factor in maintaining a low unit cost for this output.

Under the new system, it was proposed to establish, on the basis of past records, a standard unit cost of production for each productive department, based on all factors which were in any way controllable in relation to output. This would eliminate all fixed charges over which the factory had no control and for which it should not be held responsible. There would then be set up a schedule showing the proportions of the savings made that were to go into the bonus fund, and it was advocated that this fund should be distributed to all those who in any way were connected with the operation of the plant.

The figures for controllable expenses for 1927 were as follows:

Raw Material	$1,530,624
Direct Expense	1,317,211
Total Controllable Expense	$2,847,835

On this basis the consultants estimated that a saving of between $150,000 and $175,000 per year would be obtained by the installation of their bonus plan, and it was pointed out that, under the bonus system being used, less than 3% of that total controllable expense was on an incentive basis.

The greatest difficulty in the operation of the plan would undoubtedly be caused by the changes made from time to time in the processes and equipment, thus creating new conditions of operation. Such changes would necessitate the setting of new standards and, until sufficient experience had been obtained to establish them on a correct basis, the departments would have to be operated without a bonus.

The repair and maintenance gang was being operated on an incentive plan based on the savings which might be made over the estimates which were established for the different jobs. It was recognized that the weakness of the plan was in the estimates and, in place of this system, it was recommended that the engineer in charge of maintenance and the gang foreman be included under the general plant bonus. This would relate their work directly to that of current production and give them the incentive to see that the equipment was maintained at maximum efficiency. It was then believed that they could be depended upon to keep the maximum performance.

Should the incentive plan have been so completely widespread throughout this plant? If not, what types of work should have been left out?

In the event that new standards did have to be set, would it be necessary, as suggested, to operate that department without a bonus for some time? What might be the results of such a policy?

2. Birch Engineering Equipment Corporation—No. 3

WAGE INCENTIVES: WHAT BASES SHOULD BE USED FOR WAGE INCENTIVES FOR THE DIFFERENT CLASSIFICATIONS OF EMPLOYEES IN AN ORGANIZATION?

In the Birch Engineering Equipment Corporation an incentive arrangement had been used for certain officials, such as plant superintendents; the method had been discontinued, however, when the business failed to show profits. The plan used was, in the opinion of some of the officials, unsuited to the needs of the company and was incorrectly figured, which largely accounted for the apparent lack of results.

The bonus had been calculated on two items; the average manufacturing cost and the variation from the standard amount of scrap per pound of production. No differentiation was made in calculating the average cost between any of the varieties of brass tubes, although many types were actually much more expensive to make than others. Thus, in some months, depending on the tubes produed, the average cost would be low, while in other months, when production efficiency was actually just as high, average costs would be much greater.

The scrap loss was also figured in an incorrect manner, the percentage being obtained on the basis of the amount of scrap made in the tube mill divided by the total castings produced in the casting shop for the same period. Because of the variation in the types and amount of production of the two departments, there was no chance of a constant relation being maintained between these factors and, thus, a figure which was often entirely unrelated to production efficiency was obtained, proving unsatisfactory both to the men and to the company.

Although the calculation of the bonus had been unsatisfactory, the final reason for its discontinuance was the lack of profits shown by the tube division. This step did not seem to be altogether justified, because although the business might not be profitable, yet the manufacturing department might be operating at a high degree of efficiency, keeping the loss down and actually deserving the bonus. It was believed that a correct bonus plan should be considered as one of the basic points of good management and that the savings they could usually show by installing incentive methods in similar circumstances amounted to about 15% of the payroll.

In the case of general or unskilled labor, the classes of work done would, under the proposed plan, be studied and standards of performance set. The different jobs would be done on work orders and the standard times for those completed during a week, as compared with the working time of the employee, would give his efficiency, on which the amount of the bonus would be based. In the case of group labor the same general procedure would be carried out, the group bonus being distributed to the workers in proportion to their wages.

Where skilled or semiskilled workers were employed regularly on some operations, their jobs would be time-studied and standards set up. Where possible, piece wages, depending on the amount of good production, would be recommended, as they were the simplest and most direct of all incentive systems. Where work was of an intermittent character, however, some means would have to be devised so that the employee would not be penalized for conditions which were beyond his control.

The development of incentives for foremen was recognized to be a more difficult problem. The foremen were responsible for the amount and character of the production and a bonus for them should be related to those items. It was thought that the best plan would be to develop a bonus scale based on the combined efficiency of the workers under each foreman. This would give them an incentive to keep production on a high level and aid the poorer workers to increase their output.

A bonus for the superintendents would require still another method of approach. In their case it would have to be based on the entire results of operations in their departments, which could be gauged most readily by being tied in with the cost system. Through the use of standard costs, the profit or loss made in the operating departments on the output of the period would be determined and the bonus could then be based on the showing made.

Would the approaches here suggested be likely to lead to satisfactory bonus plans?

Why was it necessary to use different methods for the different types of employees?

3. Haven Rubber Company

INCENTIVE WAGE: SHOULD THE NATURE OF AN OPERATION INFLUENCE THE TYPE OF WAGE PAYMENT?

A young executive who had recently been taken into the organization of the Haven Rubber Company objected to the method of wage payment employed there. For several years all workmen had been paid upon a group bonus plan, regardless of the department in which they worked or of the type of work they were doing. This, he felt, was wrong because in many departments the workmen could not control the output, and such a plan, therefore, accomplished no end and incurred an unnecessary bookkeeping expense. To substantiate his reasoning he showed the records of past wages paid which, for many workers, had not varied in the least since the plan was inaugurated and for them had been the same as the day wage formerly received.

The superintendent of the plant agreed that this executive might be right in theory, but that in this particular case the wage payment plan was sound and did not incur any added expense. He claimed he kept no more forms under this scheme than he would require if day wages were paid, as the production of each group was indicated by the movement of materials and goods in process from each department to the succeeding one. From the records of these and the use of a time clock which each man punched upon entering and leaving the plant, he gathered all his labor and payroll data. Besides, he felt that the psychological effect of having a standard kept the men from soldiering on the job and raised the general morale of the working force above what might otherwise be expected. It defined, he stated, a definite mark which the men knew they must meet.

The new executive, however, still felt the system made unnecessary complications in the management of the plant and decided to analyze the processes used in the manufacture of the company's products, which constituted a large variety of mechanical rubber goods, such as garden hose, fire hose, reinforced hose for oil and heavy liquids, nipples for dredging lines, fruit-jar rings, rubber mats and belts. To make these articles, about 200 different compounds of rubber were necessary because of the variations in quality and color desired. Production was, however, practically standardized, the percentage of special order goods being small; the variations from standard on them were mostly with respect to the quality of the material consumed rather than from any change in the manufacturing process.

The chief processes through which the work had to run were compounding, milling and calendering, curing, winding, pressing, knitting, and packing. In all of these, the operations varied somewhat according to the product, and some products did not have to go through all processes. Also, in making a few articles, it was found possible to combine two operations. An example of this could be seen in the production of mats, these being pressed and cured in a single process.

Compounding was the first process, and all goods had to go through it. This consisted of measuring and mixing the ingredients going into the rubber, and, according to specifications, it had to be carried on for a definite length of time. The workmen who tended the machines in this department, consequently, had no control over the speed with which it was carried on. A similar situation existed in the milling and calendering operations, as the machines were automatically controlled in order to obtain uniform results. The only possible saving the workmen might make, therefore, was in the time it took to set up the machines. The machines used for curing the rubber were even more exactly regulated by means of automatic time-setting devices, so that the products would turn out in a steady quality. Here, however, the workmen might increase their production, not by saving time, but by arranging the work in the presses in the most economical manner, for depending upon the arrangement of the work on the machines it was possible to produce a varying quantity, provided all pieces were of the same thickness.

Production in several processes was directly dependent upon the efficiency of the workers. For example, when fabric was wound about the smaller hose, machines were used, but their rate depended upon the speed with which the workmen fed them. The covering of the larger hose, such as fire hose, was done entirely by a hand operation, and the work run depended upon the skill of the workers, although they were sometimes handicapped by having to use cement on materials that had been stored for any great length of time. This cement was not needed when freshly impregnated fabric was used. Another case where the speed of the labor force affected production was in the packing department, where all labor was either of a hand type or was done by machines which were regulated by the efficiency of the operator. Here much time might be saved.

The knitting process where the coverings for the fire hose were woven also showed some relation between the speed with which the men worked and the production of the department. Although the machines were set to a certain rate in order to obtain a desired structure, they stopped automatically when a thread broke and were not started up again until the break was repaired. Thus the actual time the machine ran per day was dependent upon the speed with which these frequent breaks were repaired.

Was it desirable to have an incentive wage system in all departments?

Could such psychological results as those mentioned by the superintendent be measured to prove the value of the system?

4. Thiele Manufacturing Company[1]

BONUS SYSTEM: HOW CAN A BONUS SYSTEM BE USED TO INCREASE OUTPUT AND REDUCE WASTE?

The Thiele Manufacturing Company was founded in 1900 for the purpose of producing kitchen cabinets and fan mills. The management of this organization soon observed that manufacturing costs were extraordinarily high because, it was thought, of the dissimilarity of products. Accordingly, the company discontinued the fan mill line and threw all of its resources into the manufacture of kitchen cabinets.

While this change in policy produced a satisfactory result on manufacturing costs, the chief executive was desirous of still further reducing them. In the pursuit of such reduction, the general manager acquired the services of a consulting engineer to inaugurate a plan of wage incentives throughout the factory. The various plans that were introduced had to be abandoned, however, because of dissatisfaction on the part of the workers which arose from the fact that they were ill suited to the conditions in this particular plant.

Up to 1923, the Thiele Manufacturing Company enjoyed, annually, a volume production of a practically standardized product. At this time, however, market conditions changed to such an extent that in order to maintain its competitive position, it became necessary for the company to broaden its line of kitchen cabinets and add several other lines of kitchen equipment. This variety naturally resulted in increased manufacturing costs which, together with the competition of a higher wage scale from a local automobile plant, aroused a more intensive interest in the benefits to be derived from the installation of the proper industrial methods.

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[1] Adapted from "Bonus System Pays in Hoosier Plant," by E. G. McQuinn in Management and Administration, May, 1926, p. 329.

With a view, then, to facilitating the installation of a wage bonus system, all work of a clerical nature was simplified throughout the entire plant, and a careful study was made of existing methods and of the instructions given to foremen and workmen in material- and labor-saving methods. When this study had been made to the satisfaction of the general manager, an outside executive, Mr. Palmer, was taken into the Thiele organization; he had had extensive experience in labor relations and the installation of wage incentive plans.

After a brief survey of the plant layout and operating conditions, it was learned that the plan to be adopted must be of such a nature as would reduce the material and labor costs and, if possible, at the same time reward the employees with higher wages. As a means of bringing about these results, Mr. Palmer recommended and introduced the "combined waste and production bonus plan" for each department as a group. Under this plan, bonus earnings of each group were determined from the final net material waste of the group and the net production efficiency of the group each week; these bonus earnings were included in the workmen's pay on the next pay day. Furthermore, each department had an inspector whose duty it was to pass judgment upon the workmanship of the laborers and the disposition of all culls and lumber waste returned from the other departments. All such material was sent to the department that could salvage it most economically.

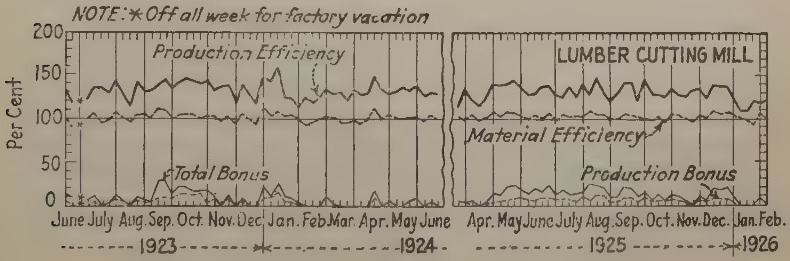

FIG. 1.

The bonus system was first introduced into the Lumber Cutting Mill department. The general manager was so impressed with the results that Mr. Palmer brought about in the mill that he authorized him to install these new methods in the other departments; this extension of the system occupied the full time of Mr. Palmer for over two years. It was soon recognized by the management, however, that, not only were the monetary savings far in excess of the cost of the bonus installation, but also the wages to both workmen and foremen were increased. Furthermore, the Thiele Manufacturing Company was able, through this reduction in manufacturing costs, to broaden its range of products very considerably. It is also significant to note that while there had been practically no increase whatever in clerical help to maintain the bonus installations, a great deal more accurate, uniform, and dependable costs were obtained in spite of the larger variety of products involved.

It was noted, however, that the results obtained in the various departments were, by no means, uniform. The performance, for instance, in the Lumber Cutting Mill, showed, for the full period from June 19, 1923, to February 9, 1926, an average increase in Production Efficiency of 30.6%; in Material Efficiency, 2.3%; and in Total Bonus, or increase in weekly pay of the workmen, 8.6%.

In the Veneer department, a much larger increase in the total bonus occurred. Here, Production Efficiency increased by 28.2%; Material Efficiency, 4.2%, which gave a Total Bonus increase of 22.7%.

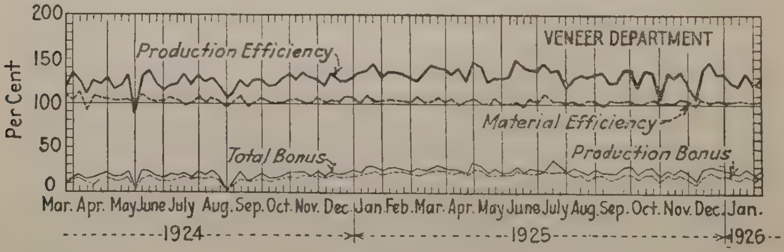

Fig. 2.

In the Table Finishing department, also, the increase in the Total Bonus was considerable. Here Production Efficiency increased by 9.6%; Material Efficiency, by 21.4%; and the Total Bonus paid, by 19.1%.

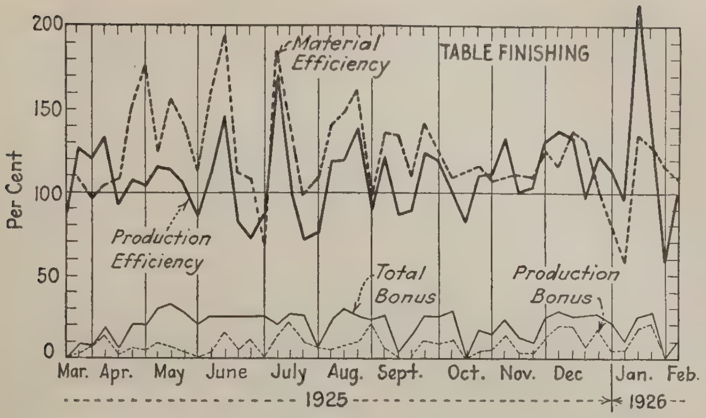

FIG. 3.

To what factors do you attribute Mr. Palmer's choice of the "combined waste and production bonus plan"?

What are the chief advantages and disadvantages of such a plan?

Name several other industries in which such a plan would be applicable. Why?

From the charts, point out the reasons for the varying results obtained in the Lumber Cutting department, the Veneer department and the Table Finishing department.

5. Rabb Hardware Products Company[1]

BONUS SYSTEM: HOW CAN A SIMPLE BONUS BE DEVELOPED FOR AN OPERATION WHERE A LARGE NUMBER OF VARIABLES ARE INVOLVED?

The Rabb Hardware Products Company manufactured a line of 66 hardware items which were bulky and difficult to handle. Because of inadequate financial resources, the company was not able to install the proper equipment for loading its products on box cars, which, along with the laborious and tedious nature of the work, resulted in a dissatisfied group of workmen, high labor turnover, and a great deal of overtime work.

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[1] Adapted from "Cutting Labor Costs 37 Per Cent," by CHARLES N. UNDERWOOD, in *Management and Administration,* February, 1926, p. 119.

In order to improve this situation, the company instructed one of the clerks in the cost department to make a study of the various operations performed in loading the cars and, on the basis of this study, to work out some scheme whereby a reduction in labor turnover and loading costs could be brought about.

The clerk, who was a recent college graduate, began his work with a study of the method used to load the cars, which was as follows:

> The shipping foreman divided his 36 men into loading crews of varying numbers. In each crew, there was a "checker," who acted as gang boss. Shipping orders were issued to the checker, who instructed his men as to what products were required, checked the number of packages brought, and weighed them. As the packages were heavy and bulky, two men were assigned to each truck. These two men took their truck to the proper bin in the warehouse, loaded it, pushed it to the scales where the checker weighed the load, then pushed it into the box car and waited for the stower to unload it. They then took the empty truck back for the next load that the checker called for.

At first, the clerk considered the provision of a separate task for each of the 66 products in each of the 103 bins in which the products were stored. There were six doors in the warehouse through which the cars could be reached. This gave a total of 40,788 combinations. At this point, the clerk was reminded by the general manager that simplicity was a prime requisite of any bonus system and that the plan which he would recommend must be such that the cost would not exceed the benefits derived therefrom. The clerk, accordingly, dropped the above plan at once, since it was entirely too cumbersome to handle in daily work and would be a possible source of errors in calculating the daily tasks.

To overcome this difficulty, the cost accountant gave instructions to begin a study with a view to classifying the various products under a few heads, and, at the same time, another study was begun to determine of what number and distribution of men the most economical loading crew could be composed. Accurate time studies were made on the loading, trucking, and unloading of each product. It was found that, although the truck held a greater number of smaller packages than of the larger ones, the truckloads of all the products were approximately of uniform weight so that the trucking time per foot was a constant quantity. In the following tables are given the data as to the physical characteristics of the various products. The figures in the last two columns were obtained from time studies.

TABLE 1

DIMENSIONS OF PACKAGES

(The first letter of the symbol denotes a package; the second letter, the brand; and the third letter, the color. R = Red, G = Green, B = Black.)

Product	Weight of One (Pounds)	Dimensions (Inches)	Number per Truck	MINUTES TO	
				Load One	Stow One
PSR	59	8 ×12¼	40	0.13	0.10
PSG	59	8 ×12¼	40	0.13	0.10
PSB	59	8 ×12¼	40	0.13	0.10
PGR	65	8 ×12¾	40	0.13	0.10
PGG	65	8 ×12¾	40	0.13	0.10
PGB	65	8 ×12¾	40	0.13	0.10
PMR	95	10 ×32	20	0.17	0.11
PMG	95	10 ×32	20	0.17	0.11
PMB	95	10 ×32	20	0.17	0.11
PTR	79	12½×32	20	0.14	0.10
PTG	79	12½×32	20	0.14	0.10
PTB	79	12½×32	20	0.14	0.10
POR	95	11 ×33⅝	20	0.17	0.12
POG	95	11 ×33⅝	20	0.17	0.12
POB	95	11 ×33⅝	20	0.17	0.12

TABLE 2

DIMENSIONS OF ROLLS

The first letter of the symbol denotes a roll; the second letter, the brand; and the third letter, the color. R = Red, G = Green, B = Black.

Product	Weight of One (Pounds)	DIMENSIONS (INCHES)		How Packed	Number per Truck	MINUTES TO	
		Diameter	Length			Load One	Stow One
RMR	85	10	36	On end	21	0.10	0.06
RMG	85	10	36	" "	21	0.10	0.06
RMB	85	10	36	" "	21	0.10	0.06
RVMR	77	8½	36	" "	30	0.08	0.05
RVMG	77	8½	36	" "	30	0.08	0.05
RVMB	77	8½	36	" "	30	0.08	0.05
RHR	90	11	36	" "	21	0.10	0.06
RHG	90	11	36	" "	21	0.10	0.06
RVR	90	11	36	" "	21	0.10	0.06
RVG	90	11	36	" "	21	0.10	0.06
RSR	54	10	32	" "	21	0.10	0.06
RSG	54	10	32	" "	21	0.10	0.06

TABLE 3

DIMENSIONS OF ROLLS

The first letter of the symbol denotes a roll; the second letter, the brand; and the third letter, the weight. L = Light, M = Medium, H = Heavy, B = Big, S = Small.

Product	Weight of One (Pounds)	Dimensions (Inches)		How Packed	Number per Truck	Minutes to	
		Diameter	Length			Load One	Stow One
REL	35	7¼	36	On end	50	0.07	0.04
REM	45	8	36	" "	40	0.08	0.05
REH	55	8¾	36	" "	30	0.08	0.05
RIL	35	7	36	" "	50	0.07	0.04
RIM	45	7¾	36	" "	40	0.08	0.05
RIH	55	8¾	36	" "	30	0.08	0.05
RPL	35	7	36	" "	50	0.07	0.04
RPM	45	7¾	36	" "	40	0.08	0.05
RPH	55	8½	36	" "	30	0.08	0.05
RTL	35	6¾	36	" "	50	0.07	0.04
RTM	45	7½	36	" "	40	0.08	0.05
RTH	55	8	36	" "	30	0.08	0.05
RL	63	10½	36	" "	24	0.10	0.06
RW	64	10	36	" "	24	0.10	0.06
RC	65	9¼	32	On side	20	0.10	0.06
RB	65	9	32	" "	20	0.10	0.06
RD	55	9	32	" "	20	0.10	0.06
RO	54	9	36	" "	30	0.08	0.05
RYB	42	7½	36	" "	55	0.08	0.05
RYS	21	7	36	" "	75	0.07	0.04
RA	30	6½	36	" "	65	0.07	0.04
RR	64	10	36	On end	20	0.10	0.06
RN	65	10¼	32	" "	21	0.10	0.06
RF	55	9¾	32	" "	32	0.08	0.05
RFH	32	8	32	" "	40	0.08	0.04
RZL	32	8	32	" "	40	0.08	0.04
RZH	43	9	32	" "	30	0.08	0.05
RU	64	8½	36	" "	30	0.08	0.05
RJ	30	6½	36	On side	65	0.07	0.04
RKS	23	7¼	36	On end	50	0.07	0.04
RKB	45	9	36	" "	30	0.08	0.05
RXL	20	6¼	36	On side	75	0.07	0.05
RXLM	25	7½	36	" "	65	0.07	0.04
RXM	30	8	36	" "	60	0.07	0.04
RXH	40	9	36	" "	50	0.07	0.05
RGL	50	11½	36	" "	20	0.10	0.06
RGH	75	13½	36	" "	15	0.10	0.08
RQS	30	8	36	" "	60	0.07	0.04
RQB	60	9	36	" "	45	0.08	0.05

After the preceding tables had been drawn up, it was possible to establish eight classes into which all the products were divided. A list of these classes is given in Table 4.

TABLE 4

CLASSIFICATION OF PRODUCTS

Class	Product	Number per Truck	MINUTES TO	
			Load One	Stow One
1	RYS	75	0.07	0.04
	RJ	65	0.07	0.04
	RA	65	0.07	0.04
	RXL	75	0.07	0.04
	RXLM	65	0.07	0.04
	RXM	60	0.07	0.04
	RQS	60	0.07	0.04
2	RYB	55	0.08	0.05
	RPL	50	0.07	0.04
	RTL	50	0.07	0.04
	RIL	50	0.07	0.04
	RXH	50	0.08	0.05
	RKS	50	0.07	0.04
	REL	50	0.07	0.04
3	REM	40	0.08	0.05
	RPM	40	0.08	0.05
	RTM	40	0.08	0.05
	RIM	40	0.08	0.05
	RFH	40	0.08	0.04
	RZL	40	0.08	0.04
	RQB	45	0.08	0.05
4	REH	30	0.08	0.05
	RPH	30	0.08	0.05
	RTH	30	0.08	0.05
	RIH	30	0.08	0.05
	RF	32	0.08	0.05
	RZH	30	0.08	0.05
	RU	30	0.08	0.05
	RKB	30	0.08	0.05
	RO	30	0.08	0.05
	RVMR	30	0.08	0.05
	RVMG	30	0.08	0.05
	RVMB	30	0.08	0.05
5	RL	24	0.10	0.06
	RW	24	0.10	0.06
	RC	20	0.10	0.06
	RGL	20	0.10	0.06
	RMR	20	0.10	0.06
	RMG	20	0.10	0.06
	RMB	20	0.10	0.06
	RSR	21	0.10	0.06
	RSG	21	0.10	0.06
	RHR	21	0.10	0.06
	RHG	21	0.10	0.06
	RVR	21	0.10	0.06
	RVG	21	0.10	0.06
	RGH	15	0.10	0.06
	RN	20	0.10	0.06
	RD	20	0.10	0.06
	RR	20	0.10	0.06
6	PSR	40	0.13	0.10
	PSG	40	0.13	0.10
	PSB	40	0.13	0.10
	PGR	40	0.13	0.10
	PGG	40	0.13	0.10
	PGB	40	0.13	0.10
7	PMR	20	0.17	0.11
	PMG	20	0.17	0.11
	PMB	20	0.17	0.11
	POR	20	0.17	0.12
	POG	20	0.17	0.12
	POB	20	0.17	0.12
8	PTR	20	0.14	0.10
	PTG	20	0.14	0.10
	PTB	20	0.14	0.10

Summarizing these data, then, it was necessary to deal with only eight classes instead of 66 products:

Class	Number of Pieces per Truck	Minutes Required to Place One on Truck	Minutes Required to Stow One in Car
1	60	0.70	0.04
2	50	0.07	0.04
3	40	0.08	0.05
4	30	0.08	0.05
5	21	0.10	0.06
6	40	0.13	0.10
7	20	0.17	0.12
8	20	0.14	0.10

Since it was possible to load all products into the cars from any one of the 103 bins through any one of the six doors, it became necessary to make a time study of the trucking time from each bin to each door. Because this trucking time was directly proportional to the distance trucked, the clerk obtained the distances from each bin to each of the doors and then computed the "time required" by multiplying the distance by the time required per foot. These time studies were made with full trucks and with empty trucks.

In order to simplify the plan, the distances from bins to doors were divided into 22 classes as follows:

Class	Feet	Class	Feet
1	30	12	215
2	45	13	230
3	65	14	250
4	80	15	300
5	95	16	330
6	110	17	360
7	125	18	390
8	140	19	415
9	155	20	465
10	180	21	500
11	200	22	520

The distances shown in these classes were those into which the greatest number fell. Those distances from a bin to a given door which came between any two of these classes were thrown into the higher of the two. In quite a number of instances, this had the effect of slightly liberalizing the time allowed for trucking.

After completing this work, which was of a more or less preparatory nature, so as to arrange the data into more workable form, an actual study was made of the details of the times required in the performance of each of the operations. This was done by making a large number of careful studies on a number of good operators. The times given below are those actually needed by the operator to perform the various operations and make no allowance to cover rest or delay.

	Minutes
A. Push empty truck into bin and make ready to load	.35
B. Put side rods up on truck when loaded	.12
C. Move truck to entrance and bin	.11
D. Slow down truck approaching scale	.11
E. Weigh truck on scale	.24
F. Move truck from scale	.11
G. Push truck from platform into car	.31
H. Push loaded truck from scale to car door	.20
I. Push empty truck from car to scale	.16
L. Push loaded truck one foot on concrete floor	.0041
M. Push empty truck one foot on concrete floor	.0035
N. Number of pieces per truck load (see classification)	.....
P. Time required to load one piece on truck (see classification)	.....
R. Move empty truck out of car to platform	.21
S. Time required to stow one piece in car (see classification)	.....
U. Let bar down on side of truck	.06
Z. Distance from bin to door (see classification)	.....

At this point the cost accountant took matters into his own hands and proceeded to develop a general formula for the time required per piece to load a truck at any bin with any product by a truck crew of two men.

$$t = \frac{A+B+C+D+E+F+G+H+J}{N} + \frac{P}{Z} + \frac{(Z-15)(L+M)}{N}$$

By means of substituting values for symbols, wherever it was possible to do so, the equation was reduced to:

$$t = \frac{1.71 + 0.5\,PN + 0.0076\,(Z-15)}{N}$$

Then the time per 100 pieces using two trucks was:

$$t = \frac{85.5 + 25\,PN + 3.8\,(Z-15)}{N}$$

Adding 25% to this for rest and delay and reducing to hours, the expression for the time allowance per 100 pieces became:

$$t = \frac{1.781 + 0.62\,PN + 0.0079\,(Z-15)}{N}$$

It was recognized, however, that it was necessary to make allowances for the use of the elevator in those cases where the bins were located on the second floor. This required time with

25% added for rest and delay was 1.15 minutes per truckload, which gave $\frac{115}{N}$ minutes, or $\frac{1.916}{N}$ hours, as the time per 100 pieces.

He then developed a formula for the time required to stow one piece in the car:

$$t = \frac{NS + RU}{N} = \frac{NS + 0.27}{N}$$

Adding the usual allowance of 25% for rest and delay, the time allowance in hours per 100 pieces became:

$$t = \frac{2.083\ NS + 0.5625}{N}$$

At this point the values for P, N, and S were substituted in the formulas for each of the eight classes of the first and second floors. This left the cost accountant with 16 general formulas having but one unknown quantity, Z, the distance trucked (see Table 5).

Table 5

Formulas for Loading and Trucking Times

(Time allowance is in hours per 100 pieces)

Class	Bins on First Floor	Bins on Second Floor	Stowing
1	.073–.00013 (Z–15)	.089–.00013 (Z–15)	.0927
2	.079–.00015 (Z–15)	.098–.00015 (Z–15)	.0946
3	.094–.00019 (Z–15)	.118–.00019 (Z–15)	.1182
4	.109–.00026 (Z–15)	.141–.00026 (Z–15)	.1249
5	.147–.00037 (Z–15)	.192–.00037 (Z–15)	.1517
6	.125–.00019 (Z–15)	.149–.00019 (Z–15)	.2219
7	.194–.00036 (Z–15)	.242–.00036 (Z–15)	.2780
8	.176–.00036 (Z–15)	.224–.00036 (Z–15)	.2364

Solving each of these formulas for each of the 22 classes of trucking distances, there was obtained a time allowance in hours per 100 pieces for each class of product for each distance. These tabulated time allowances are shown in Tables 6 and 7.

TABLE 6

TIME ALLOWANCES FOR FIRST FLOOR BINS

Class	Distance in Feet—Bin to Door																					
	30	45	65	80	95	110	125	140	155	180	200	215	230	250	300	330	360	390	415	465	500	520
1	.075	.077	.080	.081	.083	.085	.087	.089	.091	.094	.097	.099	.101	.104	.110	.114	.118	.122	.125	.132	.136	.139
2	.081	.084	.087	.089	.091	.093	.096	.098	.100	.104	.107	.109	.111	.114	.122	.126	.131	.135	.139	.147	.152	.155
3	.097	.100	.104	.106	.109	.112	.115	.118	.121	.125	.129	.132	.135	.139	.148	.154	.160	.165	.170	.180	.186	.190
4	.113	.117	.122	.126	.130	.134	.138	.142	.145	.152	.157	.161	.165	.170	.183	.191	.199	.207	.213	.226	.235	.240
5	.153	.158	.166	.171	.177	.182	.188	.193	.199	.208	.215	.221	.227	.234	.252	.264	.275	.286	.295	.314	.326	.334
6	.128	.131	.135	.137	.140	.143	.146	.149	.152	.156	.160	.163	.166	.170	.179	.185	.191	.196	.201	.211	.217	.220
7	.199	.205	.212	.217	.223	.228	.235	.239	.244	.253	.261	.266	.271	.279	.297	.307	.318	.329	.338	.356	.369	.376
8	.181	.197	.194	.199	.205	.210	.216	.221	.226	.235	.243	.248	.253	.261	.279	.289	.300	.311	.320	.338	.351	.358

Since it was found that the time required to complete a car depended upon the slower operation of the two (trucking and stowing), it was necessary, of course, to allow the time required for the slower operation. Therefore, the time necessary to stow 100 pieces was compared with each of the computed times in Tables 6 and 7 and the larger of the two was used.

Still another factor, however, had to be added. In loading the cars with various products, it was found that frequently only a part of a truckload of a given product was required to complete the quota. A study of this item showed that 3% additional time was required to cover it. Also, in finishing out a doorway in a car, an extra 4% was needed, and an extra 3% was necessary to cover the bracing of the last car. To take cognizance of these and other factors, a further allowance of 10% was added to the figures in the table. Furthermore, since Classes 6, 7, and 8 were

TABLE 7

TIME ALLOWANCES FOR SECOND FLOOR BINS

Class	Distance in Feet—Bin to Door								
	110	125	140	155	180	200	215	230	250
1	.101	.103	.105	.107	.110	.113	.115	.116	.119
2	.112	.114	.116	.119	.122	.125	.128	.130	.133
3	.136	.138	.141	.144	.149	.153	.156	.158	.162
4	.165	.169	.173	.177	.183	.189	.193	.196	.202
5	.227	.232	.238	.243	.253	.260	.266	.271	.278
6	.167	.169	.172	.175	.180	.184	.187	.189	.193
7	.276	.281	.287	.292	.301	.308	.314	.319	.326
8	.258	.263	.269	.274	.283	.290	.296	.301	.308

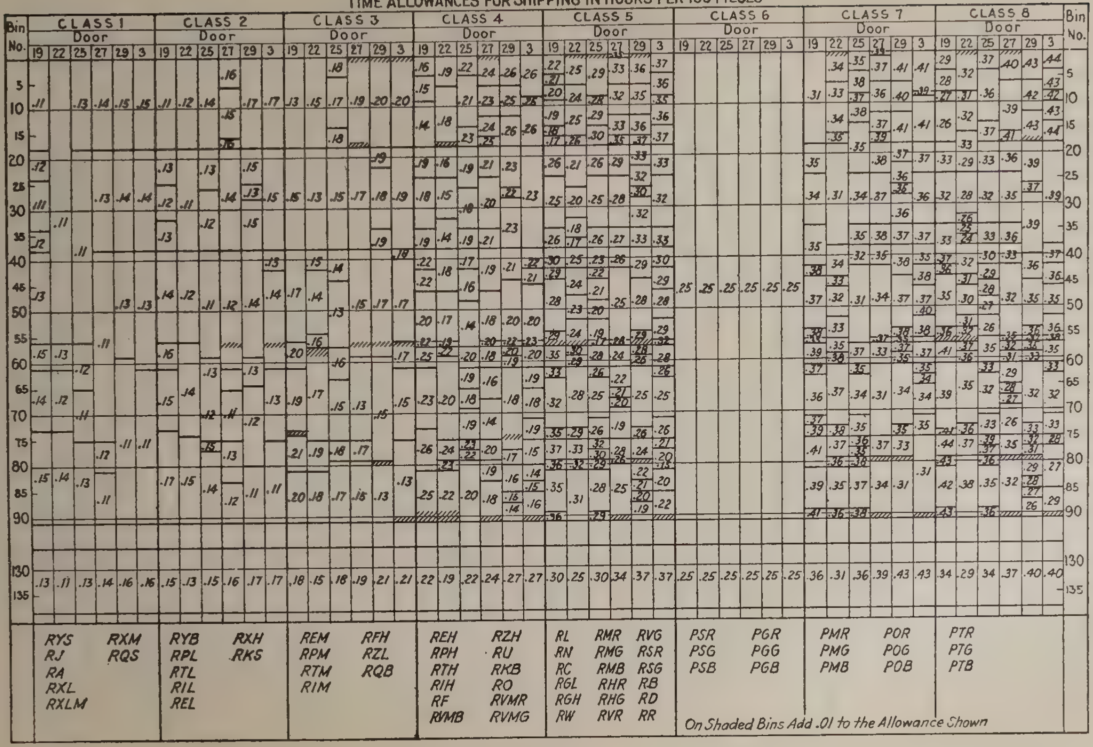
Class	Distance in Feet—Bin to Door							
	300	330	360	390	415	465	500	520
1	.126	.129	.133	.137	.141	.147	.152	.154
2	.140	.145	.149	.154	.158	.165	.170	.173
3	.172	.177	.183	.189	.194	.203	.210	.213
4	.215	.222	.230	.238	.245	.258	.267	.272
5	.297	.308	.319	.330	.340	.358	.371	.378
6	.203	.208	.214	.220	.225	.234	.241	.244
7	.344	.355	.366	.377	.386	.404	.416	.423
8	.326	.337	.348	.359	.364	.386	.398	.405

packages, they were double-decked in the bin. In loading trucks, therefore, an additional item of removing the decking lumber was involved, which had to be considered in the setting of the final values. These final values were all tabulated and, in order to make them more convenient, were transferred to a chart (Fig. 1).

This chart was used in the following manner:

Shipping Orders were issued to the warehouse foreman 24 hours in advance of the day on which they were to be shipped. Opposite each item on the Shipping Order he designated the number of the bin from which the item was to be obtained. This assured the systematic turnover of the stock. Then he assigned each Shipping Order to one of the checkers, and the order was turned over to the department clerk. This clerk then figured the time allowed for each item as follows: From the chart there were obtained the hours per 100 pieces from the designated bin to the assigned checker's door. This was then multiplied by the number of pieces required on the order. The allowed time thus obtained was noted on the Shipping Order for each item, and the sum of the allowances for all the items was obtained for the car.

TIME ALLOWANCES FOR SHIPPING IN HOURS PER 100 PIECES



Bin No.	CLASS 1						CLASS 2						CLASS 3						CLASS 4						CLASS 5						CLASS 6						CLASS 7						CLASS 8						Bin No.
	Door						Door						Door						Door						Door						Door						Door						Door						
	19	22	25	27	29	3	19	22	25	27	29	3	19	22	25	27	29	3	19	22	25	27	29	3	19	22	25	27	29	3	19	22	25	27	29	3	19	22	25	27	29	3	19	22	25	27	29	3	
130	.13	.11	.13	.14	.16	.16	.15	.13	.15	.16	.17	.17	.18	.15	.18	.19	.21	.21	.22	.19	.22	.24	.27	.27	.30	.25	.30	.34	.37	.37	.25	.25	.25	.25	.25	.25	.36	.31	.36	.39	.43	.43	.34	.29	34	.37	.40	.40	130
	RYS RJ RA RXL RXLM			RXM RQS			RYB RPL RTL RIL REL			RXH RKS			REM RPM RTM RIM			RFH RZL RQB			REH RPH RTH RIH RF RVMB			RZH RU RKB RO RVMR RVMG			RL RN RC RGL RGH RW		RMR RMG RMB RHR RHG RVR		RVG RSR RSG RB RD RR		PSR PSG PSB			PGR PGG PGB			PMR PMG PMB			POR POG POB			PTR PTG PTB						

On Shaded Bins Add .01 to the Allowance Shown

FIG. 1.

As the day was the unit on which bonuses were paid, the sum of the time allowances for all cars assigned to a crew was obtained. Thus, a crew which was slightly behind on one car was able to make up on the next and in this way complete its bonus for the day. The bonus consisted of 25% of the time allowed.

It generally happened that 6 cars per crew made an allowance close to 10 hours. There were times when the allowance was a little more than 10 hours, but it seldom happened that the crew had to work more than the 10 hours to complete the day's work, because the tasks were liberal enough to allow of their being exceeded by about 10%. On the other hand, if they finished in less than the 10 hours, the crew was allowed to go home. For instance, if a crew whose time allowance for the day was 10.24 hours finished at 5 o'clock, these men were allowed to check out and go home at 5 o'clock instead of 5.30. They were paid for 10.24 hours plus the 25% bonus of 2.56 hours, or a total of 12.8 hours at their regular day rate.

The foreman of the shipping crews was paid a daily bonus of 30 cents per day for each car-loading crew that made its bonus for the day. Whenever all the shipping crews earned their bonus on any given day, he received 50 cents per crew. By obtaining the interest and cooperation of the foremen in this manner, it was found that a great deal more care was taken by them in building up their crews with the proper type of men.

Within several months after the installation of the bonus plan, the results had already justified the change. Total labor costs were cut 37%, and the number of men engaged in loading was reduced from 36 to 18. The extra clerical work required to operate the bonus was almost negligible, since it required the time of one clerk only a few hours each day. Furthermore, not only was the labor turnover on this job reduced to practically zero, but, also, the workers took on an entirely different attitude toward the work. Each man daily received a slip which showed him what he had earned the day before. The men looked forward with a great deal of interest to receiving these slips.

Explain, in non-mathematical terms, the meaning of each of the formulas used in computing the time allowance.

On the morning of the first day that this bonus plan was in operation, the following shipping order was issued to one crew:

1100	RF	Bin 40	Door 25
602	POR	Bin 60	Door 29
1235	PMG	Bin 60	Door 22

Compute the bonus accruing to each member of that crew for that day, assuming the regular day rate to be 50 cents per hour.

What objections are there to limiting the bonus to 25% of the time allowance? Why should the company not grant an additional bonus in the event that the work is completed in less than the time allowance? What reasons, if any, are there for giving no incentive to complete the work in less than standard time?

6. Friendship Greeting Card Company

WAGE INCENTIVES: WHAT RESULTS MAY BE EXPECTED FROM AN EFFECTIVE WAGE INCENTIVE SYSTEM, AND WHAT STEPS SHOULD BE TAKEN TO CORRECT EXCESSES?

The management of the Friendship Greeting Card Company felt the need of a reorganization of the productive activities of its plant and engaged an engineer with extensive industrial experience to study the problem and to aid in carrying through any necessary changes. In his report to the executives outlining the existing conditions and his recommendations, the engineer discussed at considerable length the wage systems used by the company and how they could be improved.

The employees were working under piece- and day-wage methods, about one-third of the operators being on the former system. The engineer found that many of the piece workers, because of inaccurate standards, were earning far above the rates of pay usually obtained by their class of labor, and he further believed that over three-fourths of the remaining labor force could be put on an incentive system to advantage. The detailed statistics which he developed on this point were as follows:

Estimated total manufacturing payroll for a year for an average of 343 employees	$323,542
Portion of the payroll paid to 114, or 33%, of the employees	142,358, or 44%
Additional portion of the payroll which could be put on an incentive basis as earned by 181, or 53%, of the employees	113,240, or 35%
Total possible proportion of the payroll that could be placed on an incentive method as paid to 295, or 85%, of the employees	255,598, or 79%

Under the incentive method recommended by the engineer, it was necessary that standards should be set for all operations. These standards, in his opinion could be best developed on the basis of the amount of production per hour which could reasonably be expected under a day-wage system. In some of the departments, sufficient records of performance were available so that little or no time-study work would have to be done in setting the standards, while in other departments where the records were not so complete or so reliable it would be necessary to study the operations more carefully. In the operation of the system suggested, a minimum guaranteed daily wage would be established in connection with the standard performance for the jobs. There was to be no penalty if the standard performance was not reached, but on better than standard production the employees were to be paid at their regular rate for one-half of the time saved, in addition to pay at the full rate for the time they worked.

The estimate of the total savings in labor costs to be obtained by the changes, as made by the engineer and which he considered conservative, was about $28,400, in support of which he presented the following detailed schedule (Form 1).

CLASSES OF LABOR TO WHICH LABOR INCENTIVES ARE APPLICABLE AND ESTIMATED SAVINGS

	Estimated for the Year 1926			Estimated Savings Possible through Incentives	
	Average Number of Employees	Average Weekly Payroll	Total Annual Payroll	Per Cent of Present Payroll	Amount per Year
Counting	7	95	4,948	16⅔	825
Inspection Tables	11	147	7,665	16⅔	1,277
Card Table Work, Day Work	75	958	49,821	16⅔	8,303
Card Table Work, Piece Work	37	773	40,212	15	6,032
Hand Coloring, Piece Work (Inside)	70	1,001	52,052		
Gift Table Work, Piece Work (Normally)	7	92	4,804		
Bordering	2	63	3,260	10	326
Printing, Pressman, and Helpers, Male	23	574	29,858	12½	3,732
Printing, Stone Men	3	98	5,091	12½	636
Printing, Female Bench Workers	11	140	7,264	12½	908
Printing, Female Baker Feeders	2	31	1,602	12½	200
Die Stamping, Male	3	891	4,633	12½	578
Die Stamping, Female	10	168	8,752	12½	1,094
Cutters	6	153	7,951	12½	994
Order Fillers	18	293	15,215	15	2,282
Packers	10	240	12,470	10	1,247
Totals	295	5,717	255,598		28,434

FORM 1.

In developing the detailed estimates, the engineer had based his calculations on the studies which he had made of the processes and his knowledge of the results to be expected by the introduction of the incentive system. With the general class of labor employed by the company, his experience had shown that the maximum output might be obtained by arranging a system whereby the employees could earn from 15 to 25% over what would be for them a normal day wage. The labor savings shown in Form 1 were, therefore, worked out on the basis of the increased production per employee that could be expected in the different departments through use of the incentive system with the resultant decrease in costs. Thus, if the output per worker could be increased 50%, the number of employees in a department would be reduced by one-third, but as the bonus paid was equal to one-half of the total saving made, the net reduction in labor cost to the company would equal one-half of the wages of the workers laid off, or 16 2/3% of the new payroll of the department on a day-wage basis.

A different method of approach was necessary in figuring the savings for those employees already on piece work, and a large saving under these conditions was only expected in one department, on Card Table Work. For the workers at this center, the engineer prepared the following table (Table 1):

TABLE 1

	Number of Employees	Day-work Payroll	Average Individual Day Work Guaranteed per Month	Total Piece-work Payroll	Average Individual Earnings on Piece Work per Week	Per Cent of Earnings on Piece Work over Day-work Guarantee
Regular boxing	9	$108.00	$12.00	$193.25	$21.47	78.9
Stringing and folding	7	79.00	11.29	131.10	18.73	65.9
Bow-tying	8	99.00	12.27	231.85	28.98	136.2
Gluing and inserting tukkins	1	15.00	15.00	20.31	20.31	35.4
Work on seals	12	148.00	12.33	196.56	16.38	32.8
Total and Averages	37	$449.00	$12.58	$773.07	$21.17	68.3

The average earnings on piece work, as given in the table, when compared to the average day-work guarantee, showed the possibility of obtaining increased production in other departments, the presumption being that the piece rates were originally set on the basis of the normal output under the day-wage system.

It was also evident that the wages paid were considerably higher than should have been necessary for that class of work. The engineer estimated that with readjusted base rates and the new incentive system, a saving of 15% in the payroll should be obtained without reducing the volume of production or of raising any employee opposition.

The engineer admitted that in some cases it would be difficult to develop satisfactory standards for individual performance, particularly on such operations as inspecting and cleaning cards and on miscellaneous boxing, where the irregularities in the amount of work to be done and its nature made accurate standardization impracticable. He recommended, however, as a solution to this problem, that the gang or squad system of reckoning the premiums earned be employed. Under this method, the work to be done would be divided into rough classifications, and an average standard would be set for each group. The work to be done would then be assigned to a squad or gang and the output in terms of standard hours compared with the actual hours taken. Any bonus earned would then be divided among the members of the squad, either on the basis of the number of hours worked by each person or in proportion to the day wages earned by the workers.

The engineer believed that the system he recommended was more suitable than piece rates for use in the company. Furthermore, he thought that it would be easier to adjust the wages of those employees already on a piece-work basis by the introduction of another system rather than by making a direct reduction in the piece rates that had been established. The new system he also considered more flexible than the piece-work method, for it had been his experience that piece rates, where used, should be set on a higher standard of production than that obtained ordinarily under day-work conditions, if the employees were not to earn excessive wages when they became accustomed to it. On the other hand, the standard daily production for the method he wished to employ could be set at the normal output obtained under the day-wage system. Thus, mediocre and average workers could more easily begin to earn a premium. The company was further protected against exceptionally large earnings by employees in the event that errors were made and the standards set too low. For the company, therefore, the new system promised to reduce the overhead expense and the unit labor cost while little opposition was expected from the employees, as their regular day wages would still be guaranteed.

As the management was desirous of knowing what records it would be necessary to keep when the system was installed, the engineer drew up forms which could be used, and he indicated how they were to be related to the accounting and production control system.

The first of these, illustrated in Form 2, shown on next page, was to be used to record the time of employees when working on jobs for which individual standards had been set.

The left-hand section of the form was designed so that the report would be self-analyzing by operation and the standard times set, and, thus, the clerk posting the information could record the totals without checking the detailed items. The starting and stopping time was to be filled in by the employees, after which the production clerk was to complete the form by calculating the elapsed time and standard time for the work done, and the hours saved. One-half of the time saved—the premium time earned by the employees—was to be entered in the upper right-hand corner.

The report which is shown in the following form (Form 3), on p. 435, was to be used for recording of work on which a squad or gang would be employed.

The same information about the operations was required as for Form 2 and the additional data relative to the squad was to be filled in by the production clerk, who was also to calculate the premium time and show its distribution between the different members of the group.

The printing ticket shown in Form 4, on p. 436, was one of several similar tags to be used for the purpose of scheduling and for recording the premium earnings of the employees.

These tickets were to be made up on the basis of production orders issued to the shop and were to be held in the dispatch office from which the work passing through the productive departments was controlled. When a job was ready to be started, the dispatch clerk would tear off the first stub and give it to the workman after entering the time. On the completion of the job,

DAILY INDIVIDUAL PRODUCTION REPORT

Kind of Work Date 19

Employee No. Premium Hours

Operation								Time Start	Time Stop	Elapsed Time	Standard Time	Hours Saved
Standard												
Card No.	Quantity	Quantity	Quantity	Quantity	Quantity	Quantity	Quantity					
Totals												

Friendship Greeting Card Co.

FORM 2.

DAILY SQUAD PRODUCTION REPORT

Kind of Work Date 19

Members of Squad		Time On	Time Off	Hours on Squad	Shares of Premium Time
No.	Names				
Total Hours of Squad Total Standard Hours of Prod. Hours Saved Premium Time					

Operation							
Standard							
Card No.	Quantity	Quantity	Quantity	Quantity	Quantity	Quantity	Quantity
Total Prod.							
Standard Hours							

Friendship Greeting Card Co.

FORM 3.

the workman would return the stub and the time would again be recorded. Each day the dispatch clerk was to sort the stubs returned by employee number and send them to the production clerk, who would complete the calculations and work out the premiums earned. The production clerk then was to enter on a summary record, consisting of one card for each man, the daily premiums earned. These amounts were to be totaled at the end of each payroll week and the cards turned over to the paymaster, who would enter the weekly earnings on the regular Payroll Record. The summary card was to be so designed that it could be used to show the daily bonus earnings of an employee for a period of one year.

PRINTING TICKET

Identification Stub

Date Finished
Printing Order No.

This Run	Next Run	This Run Number					
Color	Color	1	2	3	4	5	6

Quantity
Number of Runs on Form

Press Running

Color
Printing Order No.
Press No.
Helper No.
Operator No.
Quantity to Run
Quantity Finished

Start	Stop	Elapsed Time	Standard Time	Saved Time

Check Here If Finished
Date

Make Ready

Color
Printing Order No.
Press No.
Size of Form
Number On
Operator No.

Start	Stop	Elapsed Time	Standard Time	Saved Time

Check Here If Finished
Date

Stone Work

Color
Printing Order No.
Press No.
Size of Form
Number On
Operator No.

Start	Stop	Elapsed Time	Standard Time	Saved Time

Check Here If Finished
Date

Friendship Greeting Card Co.

Form 4.

The engineer suggested that the premium earnings be distributed in separate envelopes and possibly on different days from the regular weekly pay day. This was expected to impress upon the employees that such earnings were the reward for their special effort. However, as such a procedure would require quite an amount of additional clerical labor, it was thought that almost the same effect might be obtained if the two amounts were printed plainly on the outside of the regular Payroll envelope. On the other hand, some considered that separate monthly payments of the premiums earned might be more effective. Such an infrequent payment of the bonus would then tend to make it considered as of a more special nature and would also encourage thrift in the workers, as they would rely more on their earnings to meet regular expenses instead of using both their bonus and day wages for that purpose. Further, it was contended that the longer period between payments might be expected to lessen the stimulation to increased production, the purpose for which the incentive system was being installed.

Do you agree with the engineer's recommendations as to the best incentive system to be installed?

Do you think there would be difficulty in changing the piece workers from the present system to the new one? If so, what would be your solution to the difficulty?

What method, if any, should be used to keep before the workers the fact that the bonus should be regarded as a reward for exceptional production?

7. Packard Motor Company [1]

GROUP BONUS SYSTEM: HOW MAY A GROUP BONUS SYSTEM BE ADAPTED TO THE AUTOMOBILE INDUSTRY?

Since the control of time is the most important factor, I am going to give most of my attention to telling how we have learned to handle the time element. First of all, I shall tell how we established time standards and how we pay our workmen so that variations in time and in cost of labor are kept at a minimum.

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[1] Adapted from "Quality Manufacturing at Predetermined Costs," by E. F. Roberts, *Factory*, vol. 33, October, 1924, No. 4, p. 495; and "How We Keep Costs at Their Proper Level," by E. F. Roberts, *Factory*, vol. 33, November, 1924, No. 5, p. 650.

Our payment method, which is the basis of our time cost control, is briefly described as a bonus system. But a bonus system is usually looked upon merely as a means of persuading workmen to accomplish more in each hour of work.

If we had regarded our bonus merely as a means of getting more work out of our men, we never would have adopted it. When we put our new system into operation, 95% of our force had been with us over five years, and every man on it was doing the best day's work he knew how to do, driven by what is possibly the greatest of all incentives—the desire to hold his job at a time when jobs were scarce.

* * * * * *

Our method of payment has brought us at least nine advantages.

* * * * * *

1. This payment method has made it easier for us to sustain our standards of quality.
2. It gives us the cheapest cost accounting system, the quickest, the easiest for calculating costs that we have ever known or heard of.
3. It gives us a cost system that is a positive help in production instead of a mere check on results.
4. Our payment system is the foundation for a positive, constructive control over our production problems. It helps us to plan our production and to live up to the schedules that we make. It gives us an unvarying measuring stick with which to judge the effectiveness of our work.
5. It aids us, and saves us a tremendous sum, in the control of our materials.
6. It helps us fight waste.
7. It has been a help to our men. It increases their income and makes it possible for us to recognize the ability of better workers without offending the others or getting the good workers into trouble with their fellows.
8. It has improved our factory morale. It induces team-work and cooperation in the most unexpected places.
9. It is undoubtedly one of the factors which have reduced our labor turnover.

As an incentive, our "bonus system" is of very direct value in the control of costs. Under piece work, or any other system of individual incentive, there is a tendency for the efficiency of all workers to be lowered to the general average. But our bonus tends to raise the general average in the direction of the efficiency attained by the best men.

* * * * * *

Before we worked out our present system we had had unsatisfying experience with three other methods of payment. The first of these was the day-rate method, the second was piece work, the third was a Rowan premium system which was a sort of combination of the methods of Taylor and Gantt and ourselves.

* * * * * *

We had 10 years' experience with the premium system. It cost so much in counting and inspecting that it could not be operated. In 1911 we started to put all our production under the premium system. Before the installation was completed we found that in some departments we had more inspectors and counters than we had producers.

Eventually, we decided that the only way to get rid of the abuses of the premium system was to abolish the system. So, at the beginning of 1921, we took advantage of the current state of the labor market to return to day work. Our foundry, forge, and polishing shops had never worked under the premium plan, but had remained on piece work. In these departments we also used day-work payment.

This return to a simple method of payment at a time when our men were working hard to hold their jobs (most of them, as I have mentioned, being old employees) made it possible for us to study our situation in great detail and with confidence that we were getting trustworthy reports.

The results of our investigation were astonishing. Our observations showed us that, in spite of the fact that our men were putting all their energy into their work, their production was not more than 60 or 65% as great as it could be. In one department, formerly on piece work, the efficiency was only 30%. In a few, where there were good foremen, it was as high as 70%, but no higher.

The payment method which our engineers recommended to us after this investigation may be roughly described as a "group bonus." It is not, however, a group bonus in the sense that is ordinarily given to these words. Under the premium system we found that in some operations it was difficult to identify the work of the different men and that where several men worked on one piece it was necessary to figure their premium jointly. The ordinary group bonus is intended to meet such situations as this. Ours is not.

We simply took our departments as they were organized and divided them into groups of 50 or 60 workers. In some of the groups one man's output is related to another man's. In others the only reason for the grouping is that the men are working near each other. Of course, we have found it necessary to change some of our original groupings, and if we were beginning to install the system we would make other changes. But we have found nothing wrong with the general method of group division.

Both our payment of bonuses and our predetermination of costs are, of course, based on time studies. But in establishing standards for each of our manufacturing operations we departed from the usual method of making allowances for "normal" conditions. Our time studies include no allowances whatever.

Had we permitted our time-study men to exercise their own judgment in making allowance for the various factors which may retard a worker's production, we should have had as many kinds of standards as we had time-study men. This we were not willing to permit, for a fundamental idea of our present system is that it is based on a single, uniform standard—that is to say, on a standard that is as nearly uniform as we find it possible to make it.

Because our time studies do not include allowances, they represent the production that the average worker would turn out if he worked constantly at a reasonable rate of speed and was not hampered by factors outside his own control. We do not ignore these factors, but believe that inasmuch as they are negative rather than positive, they should be kept separate from a positive measure of production.

The new payment method made an allowance from standard and gave the men a bonus in proportion as they exceeded this reduced standard. Departments doing hand operation usually had an allowance of 20% and machine departments 25%; in a few cases the allowance was 30%. With a 20% allowance a man began to earn bonus at 80%, and he received 1% bonus for every 1% by which he exceeded 80% of his standard production.

The percentage which each group earns as a bonus is computed from a certificate of the number of parts completed by each group, sent each day to the central office. The ratio of a group's production, figured at standard time, to the time it has actually worked on a given quantity is its "group efficiency." If, for example, the work actually completed in 600 hours is the equivalent of only 540 standard hours, the efficiency is 90%. If the departmental allowance is 20%, the group in this case will earn a 10% bonus.

The system was introduced first in the polishing department, which was the most difficult application. In this and other departments the suspicions of the men were gradually allayed, and the system was introduced throughout the factory. Much of this success came from recording on a score board, at 2 o'clock each day, the percentage by which the group exceeded its normal figure the day before, and the percentage for the entire pay period up to the end of the day before. This helps the men to perceive faulty tendencies in their groups as soon as they begin to develop. Departmental efficiencies have been increased from between 60 and 65% to between 80 and 95%. In one department, previously on piece work, efficiency was increased from 35 to 78%, and night work was largely eliminated.

The chief advantage of dividing the men into more or less arbitrary groups of 50 or 60 men was its great use in cost accounting and production control; it also results in better teamwork and a more cooperative spirit. These groups include not only direct producers, but indirect workers connected with them, the foreman, the assistant foreman, and the clerks, and in some cases the transport workers. This procedure is not possible in all cases. A good foreman is necessary to the success of the scheme, but the system helps to develop good foremen.

Since the group bonus is paid only for good work passed by the inspectors, there is a direct tendency to maintain quality. The men get the habit of examining materials handed to them to be sure that they are satisfactory before they do any work on them. Spoilage, the resulting reworking, and the cost of inspection itself are all reduced.

The labor turnover is much less than before, very few men being discharged by the administration. Each group seeks to bring good workers into itself and to exclude undesirables.

All men in the same group do not get the same base rate; they may vary as much as 25% according to the qualities of the men. This enables the management to take care of special ability.

Under the premium system it had been necessary to record the work of each man; now it is necessary to keep track of only 78 groups instead of 4,318 men. The payroll department has accordingly been reduced from 80 clerks to 5. Moreover, results are known within 24 hours. It is also possible to visualize the condition of any one department quite easily by stating its efficiency as a percentage of standard.

V

SUPPLEMENTARY OR INDIRECT COSTS

A. COMMON BURDEN ITEMS

1. Nicollette Chemical Company

FREIGHT AND STORAGE EXPENSES: SHOULD FREIGHT HANDLING AND STORAGE EXPENSES BE REGARDED AS AN ADDITIONAL COST OF SUPPLIES OR AS GENERAL OVERHEAD?

The Nicollette Chemical Company was undecided whether, in regard to supplies, to charge freight, expenses of handling, and storehouse expenses as an additional cost of supplies when requisitioned, or to treat those charges as general overhead expense. The supplies consisted of approximately 4,000 different articles, ranging from bricks and cement to small machine bolts, nuts, and washers. The company always had maintained a balance-of-stores control as a check on the quantity on hand and as a guide for determining when to order. A cost accounting system which would provide detailed costs for both manufacturing and non-manufacturing departments was gradually being developed.

All supplies were purchased by the purchasing department in the city office. No purchases were made except on receipt of a Purchase Requisition signed by the storekeeper and approved by the factory superintendent. The Purchase requisitions, which were made out in duplicate, indicated the quantity and kind of the supplies to be ordered, whether they were to be delivered to the storehouse or to a department, whom to notify, and the account to be charged. The duplicate was kept at the plant, and the original was sent to the purchasing department.

When the purchasing department ordered the supplies, it sent a copy of the Purchase Order to the receiving clerk. The price and terms, whenever known, and also the route of shipment were included on the order. When the supplies arrived, the yard teamster received orders from the receiving clerk to deliver the goods to the place designated. The receiving clerk was responsible for the proper receipt of all supplies and raw materials, including all parcel-post packages, except that when supplies were delivered directly to a department, the foreman usually was made responsible for checking the quality as well as the quantity received. In either case, the check was made against the carbon copy of the Purchase Order, and any variation was noted. The receiving clerk reported to the purchasing department whenever goods were received, and no invoice was paid unless his report was satisfactory.

TABLE 1

ANALYSIS OF REQUISITIONS FOR SUPPLIES IN NICOLLETTE CHEMICAL COMPANY, BY MONTHS, 1920 AND 1921

Year and Month	Manufacturing Departments	Non-manufacturing Departments	Construction	Maintenance	Delivered Direct to Departments
1920					
January	$ 2,421.70	$ 2,684.50	$ 702.44	$ 3,849.50	$ 1,890.50
February	2,307.14	2,713.42	911.18	2,671.81	1,301.16
March	2,016.43	3,104.16	2,077.50	3,514.82	1,979.64
April	1,963.68	4,876.54	2,640.37	4,070.16	1,760.20
May	2,379.29	2,431.74	1,346.68	1,813.12	1,463.40
June	2,501.06	2,614.60	943.21	2,890.79	1,911.81
July	2,517.25	3,043.12	719.67	4,112.67	867.14
August	2,311.14	3,209.61	1,989.02	5,281.15	1,329.11
September	2,222.47	4,529.13	2,334.11	3,495.65	1,400.60
October	2,175.18	6,729.21	3,332.31	5,312.34	1,078.67
November	2,095.91	4,858.87	2,852.22	5,844.43	1,109.14
December	1,380.62	2,657.26	2,071.78	3,870.31	987.50
Total	$26,291.87	$43,452.16	$21,920.49	$46,726.75	$17,078.87
1921					
January	$ 1,224.76	$ 1,755.67	$ 673.83	$ 2,479.12	$ 1,039.74
February	1,330.01	2,257.59	800.68	1,670.29	1,078.78
March	887.03	1,614.47	269.15	2,559.22	990.91
April	643.63	3,660.49	1,113.34	2,420.80	1,027.62
May	1,166.64	2,317.89	1,247.98	3,525.39	1,026.88
June	1,018.25	1,965.03	630.36	2,555.87	1,133.68
July	1,209.65	2,221.27	784.98	2,490.97	229.81
August	949.14	2,134.37	1,242.10	2,404.59	303.50
September	1,033.62	2,340.99	521.75	3,607.33	284.48
October	1,430.68	8,954.82	896.43	5,454.36	283.71
November	1,518.29	2,983.96	873.05	4,484.52	636.28
December	1,145.22	3,032.40	720.38	5,067.11	309.05
Total	$13,556.92	$35,238.95	$ 9,774.03	$38,719.57	$ 8,344.44

Supplies delivered directly to a department were not entered on the Balance-of-Stores records, but were charged immediately to the department on the Voucher Record, and the vendor was credited. Supplies delivered to the storehouse were charged to the Storehouse controlling account and entered on the Balance-of-Stores cards.

Supplies were issued from the storehouse only upon receipt of a requisition order signed by the foreman of the department requiring the supplies. Requisitions were made in duplicate, specifying the kind and quantity of supplies wanted, the department to which they were to be delivered, and whether they were to be used for maintenance, plant construction, or manufacturing. The unit price and total amount were filled in by the storekeeper. The original requisitions were filed according to departments, and the duplicates were filed by articles, from which postings were made to the Balance-of-Stores cards.

Most supplies were received in comparatively small quantities, but frequently brick, cement, lime, clay, and other bulky materials were received in carload lots. In 1921, 18 carloads of cement, 4 carloads of lumber, and 2 carloads of brick were received. The freight on the cement was prepaid, but the total freight on the other 6 cars was $680, and the freight on all other supplies was $786.52. The total expense for freight, handling, and storing supplies was $15,115.89 in 1920, and $13,346.76 in 1921.

An analysis of the Requisition slips for 1920 and 1921 gave the figures reproduced in Table 1 and summarized in Table 2.

In October, 1921, when a salvage department was established in order to dispose of old stores accumulated in the storehouse, supplies valued on the books at $3,892.18 were transferred to that department.

TABLE 2

SUMMARY OF REQUISITIONS FOR SUPPLIES IN NICOLLETTE CHEMICAL COMPANY, 1920 AND 1921

Summary:	1920		1921	
Issued to Manufacturing Departments	$26,291.87		$13,556.92	
Issued to Non-manufacturing Departments	43,452.16	$ 69,744.03	35,238.95	$ 48,795.87
Issued for Construction	$21,920.49		$ 9,774.03	
Issued for Maintenance	46,726.75	68,647.24	38,719.57	48,493.60
Total handled by Stores Department		$138,391.27		$ 97,289.47
Delivered Direct to Departments		17,078.87		8,344.44
Total		$155,470.14		$105,633.91

The Storehouse control was kept in one account in the General Ledger. In order to localize any inaccuracies which might arise, however, the inventory of supplies was taken in 33 divisions. These groups, which were not rigid, were shifted whenever a better classification became apparent. The difference between these physical inventories and the book inventory was usually about 3% of the value of the supplies issued during the year.

TABLE 3

BOOK AND PHYSICAL INVENTORIES OF SUPPLIES IN NICOLLETTE CHEMICAL COMPANY, 1921

Supplies	Book	Physical
Bags, Liners, and Twine	$ 147.01	$ 429.93
Bolts—Carriage, Machine, Stove, Nuts, Washers, and Lag Screws	1,107.99	1,258.39
Brick, Cement, Tile, Lime, and Clay	2,398.02	3,796.36
Carboy Stoppers, Washers, Wreaths, and Wire Closures	832.43	1,043.41
Compositions	686.44	739.19
Drum Gaskets, and Bungs	46.92	134.26
Electric Supplies	1,452.54	1,719.83
Electric Wire	226.65	653.07
Elevator and Conveyor Spare Parts	949.01	925.56
Filter Cloth	3,642.53	4,050.09
Glassware	897.44	1,044.51
Hardware	1,578.56	1,886.13
Iron, Steel, and Shafting	503.80	620.97
Lead—Sheet, Pipe, and Miscellaneous	2,405.22	3,020.27
Lumber	658.25	1,034.55
Metals	125.41	112.10
Meters	6.00	6.00
Miscellaneous Items	1,370.31	967.35
Motors, Generators	5,004.14	4,894.14
Oils and Grease, Cotton Waste, and Wipers	368.60	403.49
Paint Materials	45.96	262.47
Pipe and Fittings	4,262.41	3,837.23
Pumps and Parts	3,290.81	3,390.45
Railroad and Crane Equipment	944.44	1,200.97
Raw Materials	34.23	59.48
Rubber Goods and Sheet Packing	669.47	953.35
Scales and Parts	1,324.55	1,182.02
Special Castings—Cast Iron	9,617.24	8,734.24
Special Earthenware	10,111.84	9,002.19
Stoker Parts	851.56	841.66
Tower	841.17	927.39
Transmission, Gears, Sprockets, Collars, and Belting	3,068.40	3,187.40
Valves and Parts	2,710.01	2,908.93
Physical $3,048.02 over Book	$62,179.36	$65,227.38

The book value of supplies was corrected to agree with the physical inventory by debiting or crediting the general Profit and Loss account. The number of units on hand of any article could be checked with the Balance-of-Stores card at any time. In order to save labor, this check usually was made when the quantity on hand was low. An adjusting entry was made on the Balance-of-Stores card when it was incorrect. Both the book and physical inventories taken at the close of the fiscal year 1921 are given in Table 3.

How do you suggest that the Nicollette Chemical Company handle its freight, handling, and storage expenses?

2. Miner-Edgar Company[1]

USE AND OCCUPANCY INSURANCE: DETERMINATION OF THE AMOUNT OF A CLAIM UNDER A USE AND OCCUPANCY INSURANCE POLICY

The Miner-Edgar Company maintained its head office in New York, from which it supervised the general management of its different factories and controlled the sales activities of the concern.

One of the plants was located in Newark, N. J., where chemical compounds, consisting chiefly of nitrated cotton dissolved in solvents, were manufactured. The principal products made were used in the artificial leather industry and in the manufacture of paint, varnish, and lacquer.

The Newark plant consisted of three buildings, one of which was used as a storehouse, another for the making of solvents, and the third for the manufacture of the compounds. The latter building was a two-story structure on the ground floor, on which were nine machines known as mixers for use in the manufacture of the compounds, along with covered tanks and other apparatus. On the second floor special machinery and equipment were installed for handling the products. The compounds had to be carefully manufactured, as exposure to air might cause an explosion and exposure to moisture would be liable to spoil the mixtures.

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[1] *The Insurance Law Journal*, vol. 70, June, 1928, pp. 1084–1107—*Miner-Edgar Company* v. *North River Insurance Company*. *See, also*, "Use and Occupancy Insurance—Its Relation to the Accounting Profession," by Lee J. Wolfe, *Journal of Accountancy*, vol. 39, No. 4, April, 1925, p. 281.

The firm had obtained from the North River Insurance Company a use and occupancy policy for $20,000 against fire at its Newark plant, for the year starting July 9, 1925. The company also had other policies of the same kind, so that the total amount of such insurance carried was $150. In case of a fire, therefore, the liability of the North River Insurance Company would amount to 2/15 of the total loss incurred. The substance of the insurance contract was contained in the following clauses from the policy:

> $20,000 on the Use and Occupancy of the property described below.
>
> The conditions of this contract are that if the building(s) situated on the east side of Blanchard Street, Newark, New Jersey, and occupied for the manufacture or storage of chemicals, alcohol products and other merchandise in their line of business and/or machinery and/or equipment contained therein, be destroyed or damaged by fire occurring during the term of this policy so as to necessitate a total or partial suspension of business, this Company shall be liable under this policy for the actual loss sustained, consisting of net profits of the business which is thereby prevented, such fixed charges and expenses pertaining thereto as must necessarily continue during a total or partial suspension of business and such expenses as are necessarily incurred for the purpose of reducing the loss under this policy, for not exceeding such length of time as shall be required with the exercise of due diligence and dispatch, to rebuild, repair or replace such part of said building(s) and machinery and equipment as may be destroyed or damaged (commencing with the date of the fire and not limited by the date of expiration of this policy), subject to the following conditions and limits, to wit:
>
> *Total Suspension:* The per diem liability under this policy during the time of total suspension of business of all the properties described herein shall be limited to the "Actual Loss Sustained," not exceeding 1/300 of the amount of this policy for each business day of such suspension, due consideration being given to the experience of the business before the fire and the probable experience thereafter.
>
> *Partial Suspension:* The per diem liability under this policy during the time of a partial suspension of business shall be limited to the "Actual Loss Sustained," not exceeding that proportion of the per diem liability that would have been incurred by a total suspension of business which the actual per diem loss sustained, during the time of such partial suspension, bears to the per diem loss which would

have been sustained by a total suspension of business, for the same time, of all properties described herein, due consideration being given to the experience of the business before the fire and the probable experience thereafter.

Use and occupancy insurance is thus designed to reimburse a company operating a profitable business for all net profits lost because of a fire and for fixed charges which must necessarily continue during the period business is suspended, thus putting the company in the same position as regards those items as if the fire had not occurred. It is apparent, upon consideration, that the determination of the amount of a claim in case of fire becomes largely a matter of judgment based on the past experience of the company, for what profits and fixed charges would have been except for the fire must be estimated. As a guide to the establishment of the loss, a policy generally outlines what may be considered as fixed charges and what are to be thought of as operating expenses.

One condition of the Miner-Edgar Company's policy was that the company was to renew operations as soon after a fire as practicable. Further, during the period of suspension of work in its own plant it was expected to use outside facilities, if by so doing it could decrease the total net loss. A corresponding adjustment was made in determining the total loss incurred under the terms of the policy in the case such arrangements were carried out.

Another condition of the policy was that the liability of the insurance company per day was limited to 1/300 of the total face value of the policy, based upon the assumption that there were 300 working days in the year. The policy also stipulated that the insurance applied only to buildings in which the production of goods was carried on, and in case of damage to only one building or department out of several that were insured, that the liability should be proportionately limited.

The general procedure followed in the determination of the loss incurred under a use and occupancy policy was first to establish the amount of fixed charges and profits per day for which the insurance companies are liable, and then to determine the length of the periods of total and partial suspension of the business. The rest of the calculation was merely the multiplying of the liability per day under the different degrees of suspension by the periods of suspension, and the adding of the amounts so obtained to get together the total loss.

In cases where adequate records had not been maintained to determine directly the periods of total and partial suspension some other means had to be used to determine the total loss and the insurance policy set forth the following procedure:

> In the absence of credible evidence of the exact extent of period of suspension, assured may establish amount of loss as follows: (1) ascertain probable loss of production during approximate period of suspension by estimating what production would have been, had tendencies of business during reasonable period before fire continued, and subtracting therefrom actual production during said period; (2) ascertain what average daily production during said period would have been by adjusting actual average daily production during reasonable period immediately preceding fire by same rate of increase or decrease used in forecasting probable production; (3) determine number of days which would have been required to produce amount of lost production by dividing said amount by probable average daily production; (4) subtract from said number of days the days of total suspension and regard remainder as days of partial suspension; (5) loss for each day of total suspension will be average daily amount of net profit and "fixed charges" during reasonable period just preceding fire, not exceeding any maximum per diem liability fixed by policy; (6) loss for each day of partial suspension (where suspension occurred in only one of two or more departments covered by policy) will be that percentage of total per diem loss (or per diem maximum liability, as case may require) which amount of business normally done in department having suspension is of total business normally done in all departments covered by policy. Estimate of probable production during approximate period of suspension should be tested for correctness by forecast of production made by using moving average covering periods of four months for reasonable period immediately preceding fire, or by other statistical means which will indicate trend of business at time of fire.

On March 5, 1926, a fire occurred in the compound department of the Newark plant of the Miner-Edgar Company and practically destroyed the machinery and equipment on the second floor, while the roof of the structure was so badly damaged that all except that over one bay blew off. The first floor did not suffer so much, but three of the mixers were badly burned and the rest injured to some extent by exposure to water. The fire caused the complete suspension of the activities of the company for a few days, and in the case of the compound department it was sometime in August before it was finally restored to normal operation. Immediately after the fire the company rented a factory in which to continue production but only used it for one week, at a cost of $300, as the equipment was found to be unsuitable for making the quality of product required.

In presenting its claim to the insurance companies under the use and occupancy policies, the company placed its total loss at $33,956.79. Its calculations showed that the profit per day had been estimated as $288.57 and the fixed charges as $187.87, giving a total of $476.38. The accountant for the insurance company subsequently reported a total loss of $4,570.50, setting the net profit per day at $123.84 and the fixed charges at $180.86, which totaled $304.70. Although there was a substantial difference in daily liability figures worked out by the two parties, yet the wide divergence between their total loss figures was chiefly accounted for by the periods of total and partial suspension allowed. The company later adjusted its claim to $31,000, while the insurance company held that its previous estimate was correct. The argument was carried to court and a referee appointed to determine the loss incurred by the Miner-Edgar Company.

The referee in his work followed the same general procedure as the accountants for the two companies. The figures he used were taken chiefly from the exhibits made up by the company in the presentation of its case, but upon which he put his own interpretation. His calculations of the net profit and fixed charges per day were as shown on the following page:

1. The net sales figure was taken from an exhibit made by the company in presenting its case and included $24,440 of intercompany sales.

2. The cost of goods sold was taken from the same exhibit and was determined indirectly by the company by deducting 10.08% from the net sales figure for gross profit. It was inferred by the referee that this amount included the cost of intercompany sales.

4. Under terms of the policy no profit could be made on intercompany sales, but only from sales of goods to outside customers; the gross profit on these sales must accordingly be deducted. Testimony in the case showed that these sales were

Operating Statement for Period January 1 to March 5, 1926

Determination of Net Profit per Day

1.	Net Sales			$282,609.57
2.	Cost of Goods Sold			254,236.21
3.	Total Gross Profit			$ 28,373.36
4.	Deduct 10% Gross Profit on Intercompany Sales of $24,440			2,444.00
5.	Gross Profit on Sales			$ 25,929.36
6.	Manufacturing Expenses			5,762.92
7.	Net Profit before deduction of New York Overhead			$ 20,166.44
8.	New York General Expenses of $17,152.88 of which 42.67% is chargeable to Newark on the basis of sales		$7,319.13	
9.	New York Selling Expenses	$20,454.19		
10.	Deduct Expenses applicable only to Clay and Metal Dept. and Chemical Novelty Dept.	10,378.94		
11.	General Selling Expense, of which 50.86% is chargeable to	$10,075.25		
12.	Newark on the basis of sales		5,124.27	12,443.40
13.	Net Profit			$ 7,723.04
14.	Net Profit per Day ($\frac{1}{52}$ of $7,723.04)			$ 148.52

Determination of Fixed Charges per Day

15.	New York Supervision ($\frac{1}{52}$ of $993.75)		$ 19.11
16.	Office salaries		23.95
17.	Laboratory Labor		16.58
18.	Administrative Expenses (42.67% of $\frac{1}{52}$ of $4,815.37)		39.51
19.	Engineer ($\frac{1}{6}$ of weekly wage of $45.00)		7.50
20.	Superintendent ($\frac{1}{25}$ of monthly wage of $150)		6.00
21.	Plant Manager ($\frac{1}{25}$ of monthly wage of $416.66)		16.66
22.	Foreman ($\frac{1}{6}$ of weekly wage of $40)		6.67
23.	Chauffeur ($\frac{1}{6}$ of weekly wage of $35)		5.83
24.	Chauffeur's Helper ($\frac{1}{6}$ of weekly wage of $27.50)		4.58
25.	Receiving and Shipping ($\frac{1}{6}$ of weekly wage of $62)		10.33
26.	Taxes, Personal ($\frac{1}{300}$ of $945)		3.15
27.	Taxes, Real ($\frac{1}{300}$ of $1,829.52)		6.10
28.	Office Salaries, Lacquer ($\frac{1}{6}$ of weekly wage of $50)		8.33
29.	Laboratory Salaries, Lacquer ($\frac{1}{25}$ of monthly wage of $416.66)		16.66
30.	Total Manufacturing and New York General Expenses		$ 190.96
31.	General Selling Expense	$10,075.25	
32.	Deduct Commissions	1,913.94	
		$ 8,161.31	
33.	Amount of General Selling Expense which is a fixed charge, of which 50.86% is applicable to Newark on the basis of sales, $4,150.84 ($\frac{1}{52}$ of $4,150.84)		79.82
34.	Total Fixed Charges per Day		$ 270.78
35.	Total Net Profits and Fixed Charges per Day		$ 419.30

made at market or lower. The accountant for the insurance company stated that the manufacturing company made a gross profit of 10.36% on its business for the period ending June 30, 1926, and as the company itself deducted 10.08% for gross margin, the referee considered that it was fair to deduct 10% as gross profit on intercompany sales.

6. The figure for manufacturing expenses was used by the company in presenting its case, and no reason was found for questioning it.

8. The allocation of general administration expense between the two offices on the basis of sales appeared reasonable and was not questioned by the insurance company.

9. New York selling expenses as itemized included the following: Salesmen's salaries, salesmen's expenses, salesmen's commissions, advertising, traveling expenses, and general expenses for all departments of the business.

10. The amount of $10,378.94 had been segregated and was directly applied to sales work for the Clay and Mineral Department and the Chemical Novelty Department in another plant so that no portion of it should be charged to the Newark plant.

11. The balance of the general selling expenses was allocated on the basis of the balance of sales to the different plants, which gave 50.86% as applicable to the Newark plant.

14. The net profit per day was determined by dividing the total profit for the period by 52, which was the number of working days in the period under consideration.

15, 16, 17. These items were a part of the manufacturing expenses item of $5,762.92, the total of them being divided by 52 to get the charge per day.

18. This item was part of the New York general expenses of $17,152.88, of which 42.67% was applicable to Newark on the basis of sales. The total was divided by 52 to obtain the charge per day.

19. Where charges were on a weekly basis 1/6 of them was taken as the daily cost.

20. Where charges were on a monthly basis 1/25 of them was taken as the daily cost.

26. Where charges were on a yearly basis 1/300 of the amount was taken as the daily cost.

32. Among the general selling expenses was an item for salesmen's commissions, which, by the terms of the policy, are not to be considered as fixed charges. Salesmen's commissions are earned only when sales are made and, therefore, were not chargeable against a period of suspension of business.

33. This proration was made on the same basis as used for the general selling expenses in determining the net profits.

After the determination of the net profit and fixed charges per day there remained two other problems to be settled. First, the percentage of the liability per day applicable to the compound department, and, second, the period during which this loss was incurred by the company.

In determining the allocation of costs and profits between the departments the referee had to rely on his judgment as to the best method to suit the existing situation, for the company did not have an established way of handling the problem. Monthly sales figures could not be used, for they were not made up separately for the different divisions. The referee, therefore, relied upon the testimony of the accountants of the two companies.

In their previous calculations both accountants had used an allocation of 80% for the compound department and 20% for the solvent department. This figure had been determined by the manufacturing company using production figures as a base. As this was not entirely satisfactory to the referee, he investigated the matter thoroughly but did not find any evidence which would indicate that it was an incorrect division, and did find, in substantiation of those percentages, a report showing that 82% of the profit for the plant for the months of January and February had been made by the compound department. He, therefore, accepted the 80%–20% division as reasonable and just.

The next step in the procedure was the determination of the periods of total and partial suspension of the business. As both companies had agreed upon a period of three days of total suspension the referee accepted that figure without question. In the determination of the periods of partial suspension, however, real difficulty was encountered. No records had been kept by the manufacturing company on which reliable estimates could be made and it was the different solutions to this question that caused the wide discrepancy between the total loss calculated by the two companies; in both cases it appeared that the periods of partial suspension allowed were largely a matter of conjecture.

The referee was, therefore, forced to rely on an indirect method and decided to use production statistics for working out the estimated total loss incurred by the company, handling them as outlined in the policy. This base would seem quite reliable, as practically no stock of finished goods was kept on hand, and the production of goods essentially corresponded to their sale.

The production of the compound department for January and February, 1926, was 187,745 gallons, an increase of 11.3% over the production of November and December. As there was no evidence of a seasonal factor or decline in the business it was believed to be reasonable that a proportionate increase during the next few months would have taken place. The period of partial suspension was practically ended in August, 1926, and at the rate of production in January and February the production for the five months following the fire would be 469,363 gallons, which, when increased by 11.3%, would come to 522,401 gallons. The actual production for the period was 358,546 gallons, which indicated a total loss in production of 163,855 gallons. The average daily production for January and February was 3,911 gallons, determined by dividing the total production of 187,745 by 48, the number of working days during that period. Increasing this daily production by 11.3% gave 4,353 gallons as the estimated average daily production for the next five months. The number of days required to produce 163,855 gallons at this rate would be 37 2/3. Out of this period, however, there were three days of total suspension of the whole plant, and therefore the loss incurred through partial suspension after that period might be expressed as the equivalent of 34 2/3 days of total suspension of the compound department.

The loss as calculated on this basis was as follows:

3 days of total suspension at $419.30	$ 1,257.90
34⅔ days of partial suspension at 80% of $419.30 or $335.44	11,628.58
Total loss due to suspension	$12,886.48

There was one other adjustment to be made to this total, for the expense of using outside facilities. According to the terms of the policy the company was to be reimbursed for their cost and the amount of product made while using them was to be included in the determination of the total business which had been done. The cost of using those facilities was, therefore, to be added to the loss due to suspension of business and thus the total liability of the insurance companies was $13,186.48. As the North River Insurance Company held 2/15 of the total use and occupancy insurance carried, its proportional part was $1,758.20 with interest.

Do you approve of the deduction of 10% gross profit on inter-company sales?

Can you suggest a more direct method of computing the entire loss?

To what matters should the insurance company pay special attention, to protect itself from exorbitant claims?

3. Seagrave Manufacturing Company

INSURANCE EXPENSE: WHAT FORM OF RECORD WILL SHOW THE EXPENSE OF INSURANCE WITH MUTUAL COMPANIES ACCURATELY AND CONVENIENTLY?

The Seagrave Manufacturing Company carried most of its fire and liability insurance with mutual companies, and was therefore under the necessity of making the customary deposits for the purpose of providing the required reserve of the companies with which it did business. Under these circumstances the Seagrave Company did not regard the annual premium paid as the total of its insurance expense for the year, but charged also to that account 6% interest on the reserve deposited. For the purposes of (1) showing the total insurance cost involved in any one policy and (2) distributing that cost over the months during which the policy was operative, Form 1 was designed; the upper part of this form was the left side of the book, and the lower part the right side. This form illustrates a policy covering $40,000 of insurance on plant and dock structures, for which a total premium deposit of $1,200 was paid, the period being 26 months. Of the $1,200 the net insurance cost was 6% per annum, or $156 for the 26 months, the balance of $1,044 being

MUTUAL FIRE INSURANCE—PLANT AND DOCK, 1929

Number	Description	Principal Amount	Period		Invoice			Reserves	Accrued Prior	Accrued Subsequent	Current Distribution
			From	To	Date	Voucher No.	Amount				
Sundry	1 Blackstone Dep. Prem.	40,000	425.28	630.30	6/11/28	13492	1,200.00				
	2 Principal to be refunded						923.89				
	3 Interest at 6%						120.11				
	Total Refund						1,044.00				
	Estimated cost of Insurance at 6% per annum						156.00				
	Interest on principal to be refunded at 6%						120.11				
	Total Cost of Insurance						276.11		84.95	63.72	127.44

Form 1.—Left-hand side.

DISTRIBUTION

Location	Acct. No.	Jan.	Feb.	Mar.	April	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.
	238	10.62	10.62	10.62	10.62	10.62	10.62	10.62	10.62	10.62	10.62	10.62	10.62

Seagrave Mfg. Co.

Form 1.—Right-hand side.

returnable to the Seagrave Company at the end of that period. The present worth of $1,044 at 6%, due in 26 months, is $923.89, so that the interest cost for the period was $120.11, and the total cost of insurance was $276.11. Since the record illustrated was for 1929, this total cost was apportioned to prior, current, and subsequent periods. The current year's charge of $127.44 was then distributed on the right side of the record at the rate of $10.62 per month.

Since the deposit was returnable, it was in the nature of a receivable to the Seagrave Company, and was therefore to be shown as such in the company's balance sheet. Form 2, shown on next page, was therefore used to show the accretions to the present worth of this amount, which would appear at first as $923.89, and would grow at the rate of $4.62 per month for 26 months, when it would stand at $1,044, the actual amount then to be received from the insurance company.

The records in the financial books for these facts were in effect as follows:

(1) Deposits on Insurance	$923.89	
Prepaid Insurance	276.11	
To Cash		$1,200.00
To record taking out policy		
(2) Insurance Cost	10.62	
To Prepaid Insurance		10.62
To record monthly insurance cost at $\frac{1}{26}$ of $276.11		
(3) Deposits on Insurance	4.62	
To Interest on Deposits		4.62
To accrue interest on amount returnable from the insurance company, being $\frac{1}{26}$ of $120.11		

Was the idea of charging interest on the deposits as part of insurance costs a sound one?

Were the records illustrated in Forms 1 and 2 satisfactory for the purpose?

What would be the ultimate disposition of the credits to Interest on Insurance Deposits?

DEPOSIT PREMIUM a/c 6

1929

Number	Description	Principal Amount	Period		Invoice			Reserves Total Refund	Accrued Prior	Accrued Subse-quent	Current Distri-bution
			From	To	Date	Voucher No.	Amount Interest				
5-302	Blackstone Deposit	923.89	4/25/28	630.30	5/30/28		120.11	1,044.00	36.95	27.72	55.44

FORM 2.—(Left-hand side)

DISTRIBUTION

Location	Acct. No.	Jan.	Feb.	Mar.	April	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.
		4.62	4.62	4.62	4.62	4.62	4.62	4.62	4.62	4.62	4.62	4.62	4.62

Seagrave Mfg. Co.

FORM 2.—(Right-hand side)

4. Newgate Electric Company

LIGHT AND POWER: HOW MAY SPECIAL PURCHASE AGREEMENTS MODIFY A COMPANY'S COST SYSTEM?

The coal which was received by Newgate Electric Company[1] on its own railroad sidings at an average rate of two or three 45-ton cars per day, was shipped from the mine by water to Providence, whence it was forwarded by rail. Upon arrival it was either dumped into a building with an open top, preparatory to being carried immediately on a belt conveyor to the bunkers above the boilers, or it was dumped into large bins in the yards for storage. These bins were capable of holding over 10,000 tons, which was sufficient to last for approximately three months. When the coal was needed, a locomotive crane loaded a car which carried the coal from the bins to the belt conveyor, where it was unloaded by the same crane. The railroad weights were accepted on the coal, subject to periodic checks made by running the cars over the company's own track scale. The plant was given a 4% allowance for shrinkage by the home office.

At the end of each month, or, if coal had been received from several shippers, upon the arrival of each shipment, a sample of coal was collected by taking small portions from different parts of the pile or cars. After crushing, to insure thorough mixture, two quarts of the sample were sent to a Boston chemist for analysis for British thermal units. A coal clause inserted in contracts with purchasers of power called for adjustment of the price of electricity on a basis of coal of 14,800 B.t.u. per pound dry.[2]

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[1] The Newgate Electric Company supplied 17 medium-sized New England cities and towns with electric light and power. Its plant was modern and efficient, and its management was constantly endeavoring to provide good service. The power station, which was not over 15 years old, was located adjacent to a river in a very small town. Since the territory in which it was situated was one where business and population were constantly growing, it was frequently necessary to add new and larger units of machinery to replace those which were smaller and less efficient. More land was available, and the buildings were designed to permit the construction of additions.

[2] Coal Clause—Whenever during the continuance of this agreement the cost to the Power Company of Pocahontas, New River, or other coal of equivalent grade of approximately 14,800 B.t.u. per pound dry is more than $5 per ton of 2,240 pounds (this cost to include delivery in the Power Company's storage, and

When such coal, or its equivalent, cost the company for three consecutive months more than $5 per gross ton delivered, the purchaser of power paid $0.00006 additional for each kilowatt-hour of electric energy used during the said three months, and during the period that the cost of coal continued to exceed $5 per gross ton. Consequently the manager was interested in the amount of coal required to produce a kilowatt-hour of electricity. Recent shipments had averaged over 14,000 B.t.u. per pound dry.

Previous to entering the belt conveyor, the coal passed through two large spiked iron cylinders, between which it was crushed. It was then carried to large bins above the 10 boilers. A larry, which traveled on overhead tracks and had in general the appearance of a large funnel, was brought under the coal containers and the desired amount of coal was allowed to descend by gravity into its mouth. The larry was then moved along the tracks until it was in a position to feed any one of the boilers. Since coal was weighed in the larry, the amount of coal fed to each boiler was always known.[1]

After the coal was burned, the ash was dumped mechanically into pits under the boilers; it was then shoveled by hand into hand cars, and taken to the scales to be weighed before being dumped into an adjacent pit. From the pit it was moved by

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to be the average price for all coal carried in said storage, together with coal received from time to time) for any period exceeding three consecutive months, then for each five cents increase in cost over and above $5 per gross ton, the Purchaser will pay an additional amount of $0.00006 for each kilowatt-hour of electric energy used during said three months, and during the period that said cost of coal exceeds $5 per gross ton.

Whenever during the continuance of this agreement the cost to the Power Company of Pocahontas, New River, or other coal of equivalent grade of approximately 14,800 B.t.u. per pound dry is less than $4.25 per ton of 2,240 pounds (this price to include delivery in the Power Company's storage, and to be the average price for all coal carried in said storage, together with coal received from time to time) for any period exceeding three consecutive months, then for each five cents decrease in cost below $4.25 per ton, the Power Company will reduce its price $0.00006 for each kilowatt-hour of electric energy used during the said three months, and during the period that said cost of coal is less than $4.25 per gross ton.

If the quality of the coal purchased by the Power Company differs from that above specified, the average cost of coal determined as aforesaid shall be corrected to an equivalent of 14,800 B.t.u. per pound dry.

[1] Coal consumed by the plant during the first five months of 1923 amounted approximately to 7,000,000 lb. in January; 6,000,000 lb. in February; 7,000,000 lb. in March; 6,000,000 lb. in April; and 6,000,000 lb. in May. In the boilers the coal is burned at a temperature frequently reaching 3,000° F.

the locomotive crane to a large pile, where the ashes were allowed to remain until they were sold eventually as road-making materials. This method was costly and should have been improved, but no adequate solution had been found for the problem. At that time, five men used all their time in storing the coal within the plant, and a larger crew was engaged in tending the boilers and carting ashes. It had been the practice to charge all costs of handling and transporting coal to the storage points within the plant, together with the purchase price, to an account called "Boiler Fuel."

The company obtained its water from the river on which its plant was located. The river had been dredged, so that cool water, a necessity for condensing, was obtained from a depth of five or six feet. The water was metered as it came from the river, and excepting that used for condensing, it went through a purification process and afterwards passed into a pond with an especially prepared clay and gravel bottom, where it was kept ready for use. From this reservoir it was pumped to a tank on the top of one of the buildings, from which it flowed to those places where it was needed. Water being used for condensing was piped directly from the river and, after being used, was discharged farther down stream; whereas that which had been used for steam was condensed and returned with comparatively small loss to the boilers.

The steam, which was generated by the boilers, passed through large pipes into turbines which had generators coupled to them. The 13,000 volts were produced, metered, and sent over the wires from the power station to distributing substations, where it was transformed to 2,200 volts prior to being sent out to the streets, where it was again transformed to 550, 220, or 110 volts, before being consumed for power, heat, or lighting. At each stage, a check was kept of progress by means of meter readings which were forwarded each day to the home office. It was necessary to have a crew of men to oil, wipe, and repair the generating machinery, and another crew to tend the electrical apparatus. The plant superintendent sent estimated monthly costs, based on the figures, charts, and experience of the past 10 years, to the plant, where they were compared carefully with the actual outlays.

The power plant had numerous peak loads for which provision had to be made. It had been found that most power was used between 8:30 a.m. and 4:30 p.m., although an intermediate falling off at noon was apparent. In the early hours of the morning practically the only use of electric power was for street lighting; in the evening, home and street lighting were the principal uses of power, although pumping of sewage at night was resorted to in order to assist in leveling out the load. Generally the amount of power required increased from Sunday to Wednesday, but decreased gradually during the remainder of the week. The plant was called upon for a heavier production during the short days of winter than during the summer days. July was usually the month of smallest power consumption. The fact that the management was making a constant endeavor to increase the load factor in times of minimum use was one of the reasons that it maintained a salesroom for smaller electrical appliances.

Repair parts for the mechanical stokers, which were an important item, were made to order at a nearby foundry, partly to save transportation charges, but largely because the foundry had been found to be efficient and had cooperated with the plant in its endeavors to provide continuous and satisfactory service. Other parts, which were sent by the home office, were charged to the plant's fixed investment or to an account for supplies on hand. In the latter case, they were kept under a lock and key at the station and issued only by the assistant chief engineer. A book inventory was kept, which always agreed with the physical count, since the stock was small enough to permit its being under the personal supervision of the higher employees. In order to have repairs made promptly, a small machine shop was maintained at the plant.

The men worked on eight-hour shifts six days a week. Two weeks' vacation and two weeks' sick leave, both with pay, were allowed annually to each employee. No man left his post unless his relief had reported to him. Time clocks were unnecessary, as it had been found that employees complained more than did the higher officers about a relief being a few minutes late. The men's time was reported by the assistant chief engineer to the cost clerk, who in turn sent to the home office on a regular form a report signed by the chief engineer, designating the work performed each week so that the accounts to which the labor should be charged could be readily ascertained. All labor was direct with the exception of that of the superintendent, plant manager, chief engineer, assistant chief engineer, cost clerk, and the service rendered the plant by the accounting department at the home office. The cost clerk brought the money to the plant on Wednesday, at which time the men were paid for the preceding week, and the signed receipts were sent to the home office.

A small crew of men, which was on constant duty at each of the eight substations to read the meters and tend the electrical equipment, worked under the direction of the foreman who was in charge of sending the energy from the power plant. Since the electricity was metered upon its arrival at and departure from each substation, the amount lost in transit and within the station was known. Each substation sent a large daily report to the home office.

Construction and maintenance of lines and equipment were taken care of by a special gang. Automobiles, which were provided to carry the men over the territory so that emergency repairs might be made with dispatch, were housed on the company's premises at the substations.

What effect does the coal clause have on the Cost records? How does it affect the statistical information that is kept?

5. Fowler Flour Mills

POWER COSTS: WHAT COST FIGURES SHOULD BE FOUND WHERE THREE KINDS OF POWER ARE AVAILABLE?

At the Fowler Flour Mills there was no central power station, and the six mill units were operated by water, steam, and electric power. Four of these mills were equipped to run on water alone, on steam alone, or on a combination of the two. Another mill was equipped to run on water power alone, or on a combination of water power and electric power; the sixth mill used only electricity. The company wished, therefore, to develop an accounting system for its power costs which would afford figures reflecting the essential facts in the situation; among other things there had been suggested figures to show the cost of operating each mill with each kind of power, the efficiency of each power unit, and the average power cost per barrel of flour regardless of the mill which produced it.

Water power was much the cheapest, but there was seldom enough of it available to operate five mills at the same time. When all five were operating together, one of them usually had to be driven with steam power, which was almost twice as expensive as water. It was, however, not considered fair to charge the head miller of that particular mill with a total cost of steam power, since he was deprived of water power only because the other mills were using all that was available.

The following table (Table 1) gives an outline of the principal facts concerning the different mills, based on the experience of a ten-year period.

TABLE 1
SUMMARY OF POWER DATA*

	NUMBER OF DAYS OF USE IN MILLS					
Mill	A	B	C	D	E†	F
Kinds of Power Used:						
Water	125	105	266	107	....	206
Steam	124	51	....	82	....	37
Electricity	....	....	....	....	278	
Water and Steam	11	113	....	80	....	24
Water and Electricity	....	....	59‡			
Total days operated	260	269	290	269	278	267
Number of days idle	105	96	75	96	86	98
Percentage of idle time	28.8	26.3	20.9	26.3	24.1	26.8
Wheat flour produced, barrels, (hundreds omitted)	899.7	1,349.3	558.4	1,521.5	1,135.5	526.6
Maximum daily capacity, barrels	3,500	6,000	2,200	6,000	4,200	2,100
Average actual daily production, barrels	3,460	5,020	1,930	5,670	4,090	1,970

* The figures are a yearly average of operation for ten years, 1909–10 to 1918–19. The fiscal year is from August 1 to July 31.

† A six-year average. Mill E was rebuilt in 1913 and its capacity was increased.

‡ This figure is only a four-year average. The motor was not installed until 1915. The total number of days operated is not therefore the sum of the number of days operated on water power and the number of days operated on water power and electricity. The former is a ten-year average, and the latter a four-year average.

MILL A

Year	NUMBER OF DAYS EACH KIND OF POWER WAS USED			Number of Days Operated	Number of Days Idle	Barrels of Wheat Flour Produced
	Water	Steam	Water and Steam			
1909–10	151	108	26	285	80	972,600
1910–11	33	196	5	234	131	910,900
1911–12	48	251	0	299	67	916,200
1912–13	86	202	9	297	68	913,400
1913–14	164	94	9	267	98	912,900
1914–15	148	100	0	248	117	820,500
1915–16	185	49	47	281	85	1,118,600
1916–17	204	17	0	221	144	718,700
1917–18	153	105	10	268	97	713,100*
1918–19	80	116	3	199	166	747,300
Average	125.2	123.8	10.8	259.9	105.3	899,700

* In 1917–18, 12,800 barrels of rye flour and 246,200 barrels of barley flour were produced. The output per day is decreased on coarse grain. This mill will grind only 65% as much rye flour as it will wheat flour and 50% as much barley flour.

Maximum capacity on wheat, 3,500 barrels per day
Actual production, daily average, 3,462 barrels

Horse-power requirements:
  Milling .... 1,035 hp.
  Grain cleaning ... 200 hp.

Power Equipment:
  One steam engine, 1,200 rated hp.
  One water wheel, 1,575 rated hp.
  One electric motor, 200 rated hp.
  Twelve auxiliary motors, 45.5 rated hp.

The power supervisor was in favor of working out a system of standard costs, in which the Power accounts might be charged with predetermined amounts of fixed charges and the actual costs of operating the equipment, and each account credited at a standard rate per barrel of flour produced.

The cost of steam power was divided into the cost of generating steam, and the cost of manufacturing power from that steam; steam produced in the boiler room was delivered to the engine room and there converted into power. By thus separating the costs, inefficiencies could be localized and their cause more easily eliminated.

A summary of the equipment showed that four mills had separate power apparatus for grain cleaning, while the other two had their grain cleaning equipment operated on the same shaft with the mill. Auxiliary motors were used for packing flour, and for operating belts and conveyors used in packing and loading; such small motors were part of the machinery which they operated.

All water power rights in the river on which the Fowler Flour Mills was located were owned by a water power company, which leased the power at charges which varied at different periods of the year. The company owned leases as listed below (Table 2).

TABLE 2

WATER-POWER LEASES

Mills	Priority	Mill-Power	Yearly Rental
A, B, C, & D	5	4	Free
	14	4	Free
	20	2	Free
	26	12	Free
	29	3	Free
	35	14	$15,000
		39	$15,000
F	9	2	$ 400
	24	1	750
	34	1½	500
	47	3½	3,500
		8	5,150
Grand Total		47	$20,150

Excess water at $6 per mill-power day.* Payments must be made quarterly.

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* One mill-power is equal to 75 theoretical horse-power. Because of inefficiencies in the water wheels only from 65 to 70 hp. are delivered on the drive shaft, and occasionally the horse-power delivered per mill-power is even smaller.

The water leased under priorities 5, 14, 20, 26, 29 and 35 was available to either A, B, C, or D mills, but water used by any one of them decreased the amount available to the others. The priority rights were a necessary protection, when water was low, to the customers of the water power company located farther down the river; at such times the water power company notified all its patrons that a certain priority would be in force until further notice. This meant that any company holding a lease with a priority number higher than the one in force could use no water; thus, in the case of the Fowler Flour Mills, if priority 30 were in effect, mills A, B, C, and D would have only 25 mill-power available, and mill F would have only 3 mill-power. According to the agreement the cost of water not available, by reason of priority restrictions, was deducted from the amounts payable to the power company under the contract. Accordingly, whenever a priority lower than No. 35 was in effect, the A, B, C, and D mills would still be able to use 25 mill-power without charge.

When water power was short, steam power was used to supplement it in those mills where steam power could be used. The electricity was purchased by the Fowler Flour Mills from a public service corporation.

What information should the executives of the Fowler Flour Mills have had to control their power costs intelligently?

Can you suggest reasons why the company should purchase electric power when they might have used water or steam power?

What accounts should have been set up to provide the necessary information?

6. Hatton Manufacturing Company

INTEREST AS A COST: WHAT BASIS SHOULD BE USED TO COMPUTE INTEREST ON BUILDING AND EQUIPMENT?

The Hatton Manufacturing Company owned a factory which was subsidiary to its main factory and located some 200 miles away from it. In figuring manufacturing costs in the subsidiary factory the head office charged it with 6% interest upon the investment in the buildings and equipment.

At first this interest was computed upon the original cost of the assets. The buildings were, however, being depreciated upon the basis of a 25-year life, and the machinery upon the basis of a 15-year life. The manager of the subsidiary factory contended that this depreciation was equivalent to returning part of the capital investment in his factory to the head office, and that the actual investment was thereby reduced. He argued that he should be charged interest only on the net depreciated value, and not upon the original cost.

The head office replied that the buildings and machinery of the subsidiary factory were being maintained in first class repair, so that the manager was continuously enjoying the same facilities for production as at the beginning; they argued, therefore, that there was no reason why the charge for interest should be diminished.

To this the manager rejoined that the calculation of interest upon investment was a financial question having nothing to do with the facilities which he enjoyed. He said that the only question at issue was as to how much was the investment upon which he should be charged 6%, and he favored the depreciated figure.

The head office answered that the total charge being made to the subsidiary factory was in the nature of a rent—analogous to a rent that might be charged to any householder. Such rent would include a charge to cover interest on investment, repairs, depreciation, taxes, and insurance; and such total rent would not ordinarily be subject to gradual reduction with the age of the building, provided the building were kept in good repair. They declined, therefore, to make any reduction in the annual charge to the subsidiary factory.

What should be the basis for charging interest on investment in the building and equipment of the subsidiary factory, assuming that it has been agreed that 6% shall be charged for this purpose?

7. Yukon Shipbuilding Company

BOND INTEREST AND IDLE PLANT EXPENSE AS COSTS: SHOULD INTEREST ON BONDS, AND TAXES, INSURANCE AND DEPRECIATION ON IDLE PLANT BE TREATED AS A COST?

A few years ago the Yukon Shipbuilding Company had a reorganization in its management, a new president and a new production manager taking over two of the important executive positions of the business. The men who had formerly held these positions were heavy stockholders of the firm and continued to be influential in the firm so far as the development of its operating and financial policies was concerned.

When the new production manager received a copy of the Cost of Production Statement of the first ship constructed under his supervision, he was surprised to find that the cost was considerably greater than he had expected and that a loss had been sustained. Upon a thorough examination of the statement he found that two classes of cost items were to a large extent responsible, these being charges for taxes, insurance, and depreciation on idle plant, and interest on bonds which had been issued to finance the plant. He immediately took the matter up with some of the older members of the staff, who informed him that the two older executives who had just left the organization had always preferred to handle the charges mentioned in that manner, and that there was little possibility of getting them to see any other point of view. Since the two older executives were still the heavy stockholders and still remained fairly active in the concern, the new production manager decided not to create any difficulty by discussing the matter with them.

Instead, he instructed the accounting department to compute his costs thereafter without including either interest or the overhead items referred to as costs. He maintained that he had been employed to operate the plant efficiently, which he intended to do, but in so doing, he did not wish to start off with the burden that others had placed upon the concern. The plant had been greatly expanded during the World War to meet the demands of the government, which had placed large orders with the company. Since the government had agreed, in its contract with the company, to pay a proportionate share of the cost of additions and the volume of business was so great, the company made the mistake of enlarging the plant considerably beyond what its normal volume warranted. In the adjustment with the government after the war, the company had not been adequately compensated for its expenditures, so that the costs not covered remained on the books for part of the plant which was not used at the time the new production manager took over his duties. Consequently, he refused to have the "idle plant" charges included in his costs; he thought they should be charged to Profit and Loss, since those charges had come about on a plant that had been constructed for a special purpose and not the usual run of business for which he was responsible. In the case of the interest on the bonds included in cost, he felt that that was absurd, because he believed that interest on bonds, in the particular case, was akin to dividends, in that it was nothing other than a distribution of profit, since the bonds were issued to take the place of an issue of 5% Preferred Stock which had been redeemed.

The position of production manager in the Yukon Shipbuilding Company was such that the accounting department had no option in the matter of what it should do. Its problem was to discover a method of satisfying the production manager and at the same time satisfy the influential stockholders. This was finally done by the accounting department preparing two statements; that for the production manager contained all of the costs of production, with interest and "idle plant" charges excluded, the other for the stockholders showed all the charges, including interest as a cost of production. On the books of the company, both items of interest and full fixed overhead were still included as costs of production.

In the long run would there be any advantage in the production manager's suggestion that interest on bonds and "idle plant" expenses should be charged to Profit and Loss?

By following the production manager's request, might the accounting department, in the long run, merely be leading him and the company into additional difficulties?

Do you think it is wise to prepare different statements in a manner that will satisfy the various interests of a business where there is a variation of opinion?

8. Lightfoot Packing Company

FREIGHT EXPENSE: HOW SHOULD FREIGHT CHARGES ON WAREHOUSE STOCKS BE HANDLED?

The Lightfoot Packing Company, with its plant located on a spur track near St. Louis, kept warehouse stocks at some 30 different distribution points throughout the country. Its merchandise included two main groups of products, namely, (1) cases of canned and package goods of the cheaper brands, and (2) bulk food stuffs, animal and vegetable products, packed in barrels or cases. On these goods, freight amounted to a fairly large proportion of the inventory value; at any one time the total value of all warehouse stocks was likely to be around $500,000, and the freight prepaid on these goods would vary between $100,000 and $125,000. The question of the handling of freight charges came up for consideration, and the following facts were noted.

The Lightfoot Packing Company was affiliated with the Campion Food Products Company; some of the officers and directors were members of both companies, so that they tended to work together and to pursue common policies in both organizations, in the interest of simplicity of operation. When the question of freight on warehouse stocks had come up in the Campion Food Products Company, it had been decided to charge all freight payments immediately to Expense, classifying the charges by products, since the company desired to have costs and profits by products reported as accurately as possible. The result was that no freight was included in the inventory valuations of warehouse stocks—in fact, the Campion Food Products Company officials considered it an advantage to be able to use the factory cost as a uniform valuation of a case of its product, in whatever part of the country it might be located. Total warehouse stocks of the Campion Food Products Company, in all parts of the country, rarely exceeded $200,000 in value, and the total freight paid on these stocks was not likely to be more than $25,000; sales from warehouse stocks were at the rate of over $100,000 per month, so that the entire warehouse stock was completely turned over oftener than every two months. The company's balance sheet showed total current assets in the vicinity of $5,000,000.

If circumstances had been the same in the two companies, therefore, the Lightfoot Company would have preferred to write off all freight charges to Expense as soon as incurred; but the larger amount of money paid in freight, and the larger proportion of the freight expense to total inventory value, both tended to make the company officials hesitate to adopt the same policy as the Campion Food Products Company. On the other hand, they desired to avoid a very detailed record of the facts; with some 30 different products, in nearly 100 different types of packages, located in 30 different warehouse points all over the country, the specific computation of freight on all items would be a task of formidable dimensions, which the managers considered scarcely to be justified by the value of the results to be achieved.

What do you consider to be essential, or at least desirable, in the treatment of freight paid on warehouse stocks owned by the Lightfoot Packing Company?

9. Detroit Tube and Steel Products Company

SHIPPING DEPARTMENT COSTS: SHOULD SHIPPING COSTS BE CONSIDERED AS A PART OF THE "COST OF GOODS SOLD"?

The Detroit Tube and Steel Products Company manufactured hot and cold rolled strip steel, high-carbon structural tubing, and molded steel tubing. The chief accountant had been trying to work out a system that would enable him to apply shipping costs direct to the cost of sales but had not been able to do so to his full satisfaction.

The main product, tubing, was shipped bundled, loose and boxed, both in carload and less-than-carload lots. Some of the boxes were purchased and others were made. The tubes ranged in sizes from 3/16 of an inch to 3½ inches in diameter and weighed from .058 to 3.681 pounds per foot.

The items which made up their shipping department costs as taken from their Expense analysis were:

1. Foremen and Clerks
2. Indirect Labor (subdivided as follows):
    - Box Making
    - Bundle, Count and Sort (not crated)
    - Pack, Count and Sort (crated)
    - Loading Trucks (not crated)
    - Loading Trucks (crated)
    - Loading Cars
    - Miscellaneous (measuring tubing, storing tubing, blocking cars, etc.)

3. Supplies (subdivided as follows):
    - Lubricants
    - Boxes, purchased
    - Lumber for Boxes
    - Lumber for Blocking Cars
    - Nails
    - Miscellaneous (chalk, stencils, tags, etc.)
4. Perishable Tools
5. Freight, Express and Cartage (hired from outside)
6. Repairs to Machinery and Equipment
    - Labor and Material
7. Repairs to Tools
    - Labor and Material
8. Employees' Liability Insurance
9. Taxes on Machinery and Equipment
10. Depreciation on Machinery and Equipment
11. Items prorated from other departments
    - Trucking (covers 50% of own automobile trucks)
    - Building (covers depreciation, taxes, etc., of floor space)
    - Heating (based on floor space)
    - Power (estimate of amount used)
    - General Plant (covers supervision, cost, payroll, engineering, sweepers, tractors, etc.)
    - Maintenance Department Overhead (based on cost of labor for work done for shipping department)
    - Machine Shop Overhead (based on cost of labor for work done for shipping department)

The methods given below were commonly used to distribute shipping expenses to the total cost of the various products handled.

1. Where the product was packed in a standard package which might go either to finished stores or direct to cars, the cost of packing, stenciling, and other similar charges was absorbed in the finishing department costs and allocated to the products along with the other costs of that department.

2. Where shipments consisted of a miscellaneous assortment and variety of products and quantities, the cost of shipping was prorated to classes of products shipped on the basis of relative production costs of those classes.

3. Where goods were shipped in large volume and called for special and expensive packing charges, including special boxing, crating, car bracing, and the like, the packing department was

set up as a manufacturing department. The costs of packing and shipping individual lots were then determined. In this case, material such as lumber became a direct material charge. Labor incident to crating and boxing became direct labor. Heat, light, and power, and miscellaneous shipping supplies became departmental expense charges and were prorated to the various items on the basis of direct labor which was accumulated on the respective orders.

The chief accountant had studied these methods but felt that none of them would solve his own particular problem.

Develop an original method or combination of methods that would allocate shipping costs accurately for the Detroit Tube and Steel Products Company.

B. WASTE AND SPOILAGE

1. King Textile Mills

WASTE: HOW SHOULD WASTE BE ACCOUNTED FOR IN A TEXTILE MILL?

Although in the King Textile Mills,[1] allowance was made for cotton waste in the cost of the finished product, no account was taken of the loss in labor and overhead applied to this waste.

Waste occurred in all but two of the operating departments of the mills, as shown by the percentage of waste or regain in Form 1.

In the picking and carding department, the waste was composed of the hoops and sacking removed from the bales and the foreign matter and short-length fibres removed by the picking and carding machines. In the spinning department the waste was chiefly broken yarns although some lint was accumulated in the machines. The waste from the spooling department and from the warping department consisted also of broken ends of yarn. In the dressing and drawing-in department there was some waste of broken ends, but there was a regain in the weight of the sizing materials which remained in the warp yarns. The

[1] The King Textile Mills, equipped with 5,000 looms and 200,000 spindles, produced standard grade goods which were sold through commission agents.

Operating Departments *	Loss
1. Picking and Carding	16%
2. Spinning	4%
3. Spooling and Warping	.5%
4. Dressing and Drawing-in (Warp only)	10% Regain
5. Weaving	2%
6. Cloth Room	0

Form 1

* In the picking and carding department, the cotton bales were opened, the fibres broken apart in the picking machine, and the cotton cleaned. Fibres were then laid in approximately parallel position and further cleaned in the carding machines. From the carding machines the cotton in laps was drawn out into ropes on slubbing frames, into thinner ropes on intermediate frames, and into a heavy cord or roving on the speeders. In the spinning department, the rovings from the speeder frames were combined with other rovings, drawn out, and twisted into yarn. In the spooling department several bobbins of yarn received from the spinning department were wound in a continuous length on large spools; then these spools were unwound and rolled on a warping beam in the warping department. Each beam contained the number of warp yarns required for one-quarter to one-sixth the width of cloth into which it was to be woven. Four to six of these beams were combined in the dressing and drawing-in department into a single slasher beam, after being passed through sizing material to give the yarn strength sufficient for the weaving process. In the weaving department the filling yarn, which was received from the spinning department on bobbins, was woven into the warp on the looms. The finished cloth was sent from the weaving department to the cloth room where it was inspected, baled, and shipped.

weaving waste was caused by imperfections in the weave which had to be cut out, and by oil which dropped on to the cloth. A large percentage of this spoiled cloth was sold as seconds at a slightly reduced price.

In addition to these visible wastes there were invisible wastes due to the moisture content of the cotton, because the weight of cotton might vary 8% with the amount of moisture content. There was also a waste in the minute fibres which floated away in the air.

From the standpoint of operating, the waste problem was one of watching the grade of cotton which was put into process and of keeping the machines operating efficiently. The waste from each set of machines was kept separately and carried in containers to a waste room where its weight was entered on a Waste sheet according to source. Operatives and workroom supervisors could detect excessive waste quickly, and adjust machines to eliminate it. The total waste per week was kept by departments and types of machines, but was not used either for controlling waste or in accounting for waste.

In pricing a style of cloth the standard weight per yard was multiplied by a standard percentage which made an allowance for the cotton waste in process. Thus, with cloth weighing a pound for five yards, the amount of cotton going into that cloth was one pound divided by 80% (20% waste) which at the cost per pound of cotton gave the amount added to manufacturing costs for the raw material. The waste percentage was arrived at by finding the difference in pounds of cotton opened up during a representative year and the pounds of cloth produced during that period. The balance, adjusted for sales of waste, was considered the gross waste of the mill.

Since, however, the manufacturing costs were built up on a pound basis in the various departments without the allowance being made for waste, the costs were not accurate. A more recent method of costing a representative style of cloth composed of Number 30 filling and Number 28 warp[1] is as shown in the following tables.

TABLE I

FILLING—30's

	Picking and Carding	Spinning
Direct-labor cost per pound*	1.552 cents (80.01%)	2.36 cents (35.88%)
Cost after adding percentage for indirect labor†	2.795 cents (84.88%)	3.21 cents (95.75%)
Cost after adding percentage for burden†	5.167 cents	6.28 cents

* Piece rate, except in spinning department, where operatives were paid on a day basis for each side of a spinning frame tended. The cost per pound there was determined for 100% production by figuring the size of the yarn (yards to pound), the r.p.m. of the front roller through which the yarn passed before being wound on bobbins, and the day rate of the operative tending the machine.

† Percentages were figured for a normal period.

The management had found that in a nearby knitting mill, waste was accounted for in a different manner. Each depart-

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[1] These numbers were the "count" of the yarn used for filling and warp. The count of cotton yarn was based on the number of hanks of 840 yards to a pound. A 28's yarn was 28 hanks to a pound.

TABLE 2

WARP—28'S

	Picking and Carding	Spinning	Spooling	Warping
Direct-labor cost per pound*............	1.257 cents (80.01%)	1.72 cents (40.94%)	.8841 cents (24.92%)	.176 cents (108.91%)
Cost after adding percentage for indirect labor†.............	2.273 cents (84.88%)	2.42 cents (95.75%)	1.10 cents (36.47%)	.37 cents (36.47%)
Cost after adding percentage for burden†..	4.202 cents	4.74 cents	1.50 cents	.50 cents

TABLE 3

DRESSING AND DRAWING-IN (WARP)

Total payroll $700.60 ÷ pounds warped 88,655 = $ .79 cents per pound
With overhead (64.51%)† = 1.30 cents per pound
Starch and sizing $765.04 ÷ 88,655 = .86 cents per pound

$2.16 cents per pound

TABLE 4

Weaving		Cloth Room	Cents per yard
Direct labor* per pound	2.00 cents		
Cost per pound† with percentage for indirect labor	(68.69%) 3.374 cents	Total payroll 641.55 (Yards product 626.345)	= .102
Cost per pound with percentage for overhead†	(69.12%) 5.71 cents	Overhead (51.16)	= .052
		Packing materials $221.82	= .035
			.189

* Piece rate, except in spinning department, where operatives were paid on a day basis for each side of a spinning frame tended. The cost per pound there was determined for 100% production by figuring the size of the yarn (yards to pound), the r.p.m. of the front roller through which the yarn passed before being wound on bobbins, and the day rate of the operative tending the machine.

† Percentages were figured for a normal period.

ment was charged with its raw material at a cost including material and labor of the department preceding, and in turn charged the next department for the raw material which it delivered at a cost which included both raw material and accumulated labor. A monthly statement was made, and a physical inventory taken

TABLE 5

COST CARD

Cloth Style X	Weight, 5.00 Yards per Pound		Width, 32 Inches
			Cost, Cents per Pound
Yarns:			
Warp 28	55.5% × 10.94 cents	Pound Cost =	6.07
Filling 30	44.5% × 11.45 cents	of Yarns =	5.10
			11.17
Dressing and Drawing-in	Warp 55.5% × 2.16 Cents per Pound	=	1.20
Weaving		=	5.71
Cloth Room and Packing	.179 Cents × 5.00	=	.95
Total Manufacturing Cost			19.03
Selling Expense	3% of 50 Cents per Pound (Estimated Selling Price)	=	1.50
Cotton	22 cents ÷ 82% (Waste Allowance)	=	26.83
Cost per Pound			47.36

by valuing the goods in process in each department at a material cost plus a standard percentage for the amount of labor. The inventory was thus always conservatively valued. Each department showed a profit or loss on standard so far as prime costs were concerned. The final department was credited with the material at a figure which was accepted as the cost of sales.

This cost of sales should have checked with the cost shown by the Manufacturing account, which arrived at a profit and loss independently by accumulating as debits all labor material and burden costs during the period and the sales as credits. In this account the inventories of each operating department were valued at a standard rate for both labor and overhead added to the actual cost per pound of the raw material. Waste was accounted for by including the total accumulated charges of labor and raw material in the cost of the product turned over by one department to another.

Since this system made no distribution of burden to departments, it was impossible to secure an accurate value of inventories of goods in process or an accurate allocation of burden to the mill's different types of product. It had the advantage, however, that the simplicity of bookkeeping permitted the compilation of monthly statements which indicated the actual costs incurred in the plant and the profit made. It was argued that the application of burden as a percentage of labor costs accumulated on each style of product gave an accurate valuation for inventory and costing purposes, and that at the same time it made unnecessary the distribution of burden to the operating departments. The fact that inventory taking required one afternoon per month of the overseers and their assistants was considered a minor objection by the knitting mill. There was, however, some difficulty in making these inventories accurate, because goods in process had to be estimated; variations from this cause might affect the profit of a short period considerably.[1]

Under its system, the King Textile Mills minimized the effect of such variations by taking inventories quarterly instead of monthly. It also distributed burden to operating departments, so that the differences in overhead absorbed by the several counts of yarn and styles of cloth were reflected in their costs. It has been pointed out that by using the waste percentages in the different operating departments, and by working back from the weave room it was possible to express direct labor costs in pounds of finished product rather than in pounds actually worked. Then, if indirect labor and overhead were applied to this cost, allowance would have been automatically made for loss in waste of overhead and labor in the manufacturing cost of the finished product.

What method should the King Textile Mills have used in accounting for overhead and labor in waste?

For what reasons was it desirable to get accurate measures of waste?

Is it necessary to do so on a departmental basis? Why?

Revise the Cost card in this problem to show the effect of changes you suggest.

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[1] Goods in process might have been yarn or rovings on thousands of bobbins, each of which had a slightly different quantity of material on it; it might have been different lengths of picker laps, which were sheets of cotton wound on steel beams or cores; or it might have been partially used warp beams which contained the yarn not yet woven into cloth. The weight of these had to be estimated.

2. Wiler Iron Works

SCRAP MATERIAL: HOW SHOULD SCRAP MATERIAL BE ACCOUNTED FOR?

One of the problems which confronted the Wiler Iron Works was the proper accounting for scrap material. Although the company operated a number of departments, only two were concerned with the question of scrap; these were the foundry department and the street railway department. The latter produced frogs, switches, and crossings for street railroads, making them from steel rails which had to be purchased in standard lengths of 30 to 33 feet. Since it was seldom that an order for any of these products required standard lengths of rails, a considerable number of short pieces was always left over, varying in length from 1 to 6 feet.

There were three possible uses for these short lengths; they could be used on other jobs in the street railway department; they could be sold as scrap; or they could be used as raw material in making semi-steel melts in the foundry. The experience of the company had been that all pieces of rail 4 feet or more in length could be utilized on other jobs; in order to facilitate such a use of these pieces, they were stored in separate piles for each length in close proximity to the stock of standard lengths, and were still considered as raw material instead of as scrap. The quantity of pieces 4 feet or less in length remaining on hand were considered as scrap because the street railway department could ordinarily make no use of them. Although the quantity of these lengths was relatively small, it was ample to supply the needs of the foundry for that type of material.

The foundry consumed about two tons of this scrap steel daily for its production of semi-steel castings, the problem involved being that of determining the price at which the foundry should be charged for this material. Since the foundry would have had to purchase scrap steel from outside sources if none had been available within the plant itself, it was decided that the foundry should be charged at the current market price for such material and the street railway department Scrap account should be credited at the same price for the quantities transferred. Usually, the current market price of scrap steel was $25 to $30 less per ton than the current market price of new steel.

The entire production in the street railway department was on a special order basis, which had led the company to adopt the job cost method of accounting. When new steel was taken from stock to produce an order, the job account was charged with the full length of rails requisitioned and the New Steel Inventory account was credited at the cost price of that material. During the process, the job account was credited with the full cost of the scrap lengths remaining and the street railway department Scrap account was debited. This meant that the Scrap account was charged for short lengths left over on orders at the new steel price, and credited, when the material was transferred to the foundry, at the current market price of scrap for the quantities of scrap involved, the balance of this account being carried to the Profit and Loss account monthly.

The management had reached the conclusion that the system of crediting scrap to individual jobs in the street railway department entailed the use of more clerical help than the value of the scrap material justified. This conclusion seemed warranted, since an analysis of the company's production costs in the railway department showed that the total cost of a job was usually comprised of 50% for labor, 35% for burden, and 15% for material, thus indicating that the material cost was a minor element.

The pieces from 4 to 6 feet long which were used on other jobs were charged to the jobs at the cost of new steel. If the lengths requisitioned were not entirely used up, no adjustment was made in the job account. The accounting for these lengths caused no particular difficulty, therefore, since the job stood the total cost of the material even though some small pieces might be left over.

Do you consider the company's policy of pricing scrap to the foundry to be sound?

Was the company obtaining an accurate distribution of charges to the departments here considered?

What options as to method, if any, did the company have in pricing and accounting for the material transferred from the street railway department to the foundry?

Do you believe, with the management, that the system of crediting scrap to individual jobs cost more in clerical work than the scrap was worth?

3. Montrose Company

THEFT OF MATERIAL: WHAT CHECKS AND RECORDS MAY BE USED AS PRECAUTIONS AGAINST THEFT?

The Montrose Company manufactured radio sets and supplies. Completed sets were assembled from parts purchased from other manufacturers and from parts manufactured and assembled in the company's own plant. Assembled sets were finished in attractive mahogany and walnut cabinets and retailed for prices ranging from $100 to $285 each; the various models differed fundamentally only in the number of parts assembled. The basic mechanisms of a radio set were a detector and a selector; the former was a device through which radio signals could be detected, and the selector was a mechanism designed to eliminate from the receiver all signals except those of the wave length desired. When two transmitting stations which operated on the same wave length broadcasted at the same time, difficulty was experienced in eliminating the undesired signals; in order therefore to intensify the signals received and to make them louder and sharper, devices known as "amplifying tubes" were used. A small radio set contained at least one detector and one selector, whereas larger sets might contain two or more selectors and as many as six or more amplifying tubes.

The true radio "fan" usually constructed his own set from parts purchased from radio supply dealers or made by himself. Beginning with a small set, he could add to it from time to time in order to extend its receiving radius. The Montrose Company furnished retailers and wholesalers with material and parts for this type of demand. Many of the factory employees of the company were radio enthusiasts and had sets of their own; in order to increase the capacity of their sets, or to assist their friends to build sets, a few succumbed to the temptation to take parts which went through the factory in the processes of manufacturing or assembling, especially in the latter. The manufacturing costs of these parts varied from a few cents to several dollars a piece, and it was estimated that the loss from missing parts amounted to between 3 and 3½% of the total manufacturing cost of products, which consisted of material, 40%; labor, 30%; and overhead, 30%.

When orders were received at the factory for sets in excess of minimum stock limits, they were translated by means of standard bills of material for each model into production orders for the required number of component parts. Production orders were of two kinds: those which authorized the manufacture of parts from raw material, and those which authorized the assembly of manufactured parts to make complete sets. Cost sheets were kept for each part manufactured, and a record was maintained which showed the comparative costs of the different lots produced. All finished parts were stored in a separate storeroom.

When assembling orders were issued, the foreman under whose direction the work was to be done signed for the material delivered to him from the finished parts storeroom; only a sufficient number of parts were delivered to complete the sets authorized in the assembling order, and if it was impossible to complete the required number of sets because of missing parts, an extra stock requisition was made out by the foreman. That requisition, however, required the signature of the factory superintendent before the additional parts could be obtained from the storeroom, and before he would authorize the issuance of the extra material, the foreman had to explain what had become of the original parts.

It was required that defective parts, spoiled during the process of assembly, be returned to the foreman by the workmen. Many small parts, however, such as screws, nuts, and bolts, which had little value, were lost on the floor and swept out. If the foreman could not produce spoiled parts, or could not explain satisfactorily the disposition of the parts issued on the original order, the superintendent assumed that employees had taken them.

Parts issued to replace defective or spoiled work were charged to the departmental Overhead Expense account; some loss of material from these causes could not be prevented, and the management decided that it should be charged against the department as a whole and not against particular jobs.

The material delivered on the extra stock requisitions to replace material lost from other causes, such as theft or sweeping out, was, on the other hand, charged to the order, in addition to the original material issued for the order, thus charging the order for more material than actually went into the completed sets. The general manager maintained that that was the best method of charging this cost, because he wanted each order to stand its own losses. He desired that the losses from missing materials should be shown for each lot of sets assembled, in order to trace the responsibility for the losses to the foremen under whose direction the work was done.

The cost accountant questioned this procedure. Since the foremen were held responsible for materials delivered to them, he contended that losses from theft should be charged directly to the foreman, by charging the departmental Overhead Expense account. If pilfering of parts could not be stopped, each order going through the department should stand its proportionate part of the total loss on the same basis as other overhead expense charges. Because the accountant regarded those losses as manufacturing losses, he did not favor charging them to the general Profit and Loss account.

The possibility of reducing theft losses had been discussed by the management several times. Proposals to subject the employees to search for missing parts had not been favored, because it was doubtful if the workers would consent to any method of searching. The factory of the Montrose Company was located in a small community where most of the workers owned their own homes, and the management believed that most of its employees were reliable and that the stealing was done by a comparatively few men.

No method of holding the individual workers responsible for parts delivered to them seemed practicable. Sets were assembled by a continuous process, in which semicompleted sets passed from one group of operators to another. It availed little if each worker was given a bench in which he could lock loose parts during the night, if such parts could easily be taken in case he left his bench for only a few minutes during the day, when it was covered with work, and could not conveniently be locked for a short time. If the assembling process were changed so that each worker assembled sets from beginning to end, it would be easier to make each man responsible for all parts delivered to him, but production of finished sets would be retarded, and manufacturing costs would increase more than the amount saved in preventing material losses.

To make foremen financially liable for missing parts seemed impracticable, because no foreman would consent to be responsible for the integrity of 50 or 100 persons working under him. The factory superintendent watched the record of losses, and if the proportion of losses to manufacturing cost on any lot of products became high, he censured the foremen until vigilance on their part reduced the amount. Although losses amounted to about 3% of manufacturing cost, this did not seem large for any one order, but total losses at the end of the year amounted to several thousand dollars. Even in the face of the large actual losses, the superintendent believed that nothing could be done except to remind the foremen continually to watch losses more closely as the percentage of losses to manufacturing costs increased. The possibility always existed that the foremen would spend so much time in keeping down theft losses that they would neglect their other duties, and losses resulting from idle employees or improper planning of work would more than offset the amount of the theft losses.

How should the losses caused by theft of material be accounted for?

4. Tarrant Company

LOSSES FROM BREAKAGE: WHAT RECORDS OF GOOD PRODUCTION AND LOSS SHOULD BE KEPT WHERE BREAKAGE IS A LARGE FACTOR?

The products of the Tarrant Company consisted chiefly of a wide variety of electric light shades and decorated lamp bases. Breakage of products while in process was an important factor and demanded considerable attention; the company therefore established a series of records to account for this factor and to bring it to the attention of the executives.

The manufacturing processes were divided into two main parts. First, there was the melting of the glass materials, the formation of the articles in the press or blow shops, and the annealing of the products to relieve the strains set up during their formation. Secondly, there were seven departments which did finishing and decorating work; to any one or more of these the products were routed according to what was to be done on them. It was in these latter departments that breakage became an important item. Another factor in connection with damaged articles, which also had to be recorded, was the reconditioning work done by the different departments. When work which had been sent along to a later department was found to be imperfect it either had to be scrapped or repaired and the resultant charges made to the correct production centers.

In four of the departments the original source of information from which the breakage records were developed was the employee's Daily Time slips. These slips were made out showing the number of pieces of work delivered to the employees, the number of pieces of good production, and the number of pieces broken. The time taken on the different jobs was also recorded in order to make possible a comparison with the standard times that had been set, although the employees were paid on a day basis. In the other three departments the records of good and spoiled production were obtained from the inspectors' reports.

For each department there was made up from the records just described a Daily Breakage Report, on which were entered the name of the article and code number, the number of the employee responsible for the breakage, the number of pieces spoiled, the standard cost of the product through the previous operation, taken from the article Standard Cost Card, and the amount of the loss obtained by extending the number of pieces spoiled by these standard costs. All work spoiled in the department was entered on these sheets, which were totaled at the end of a period giving the cost of the spoilage; this amount was carried to the department cost sheet for the period and there entered under the heading "Excess Breakage Loss."

The cost sheets for the different departments were made up on a budget plan, the department being credited at standard rates for good production and charged with the actual cost of operation. Any amount entered on the cost sheet and recording a loss would, therefore, lower the efficiency of operations of the department and be watched closely.

In one department, spoiled work was a normal condition because of certain factors in the preceding processes, over which it was difficult to secure complete control. To meet this situation, a standard allowance for spoiled production was established for the center and the department was penalized only for an amount of spoilage greater than the normal.

When defective articles were received by a department, they might either be repaired or destroyed, according to how serious the defect was; if by some additional work the items could be salvaged, the department reconditioned them. When such reconditioning was done, the charge for it was entered from the workman's time ticket on a summary sheet which debited the department originally responsible for the damage with the cost of doing the work. When items were destroyed a Defective Ware Report was made out which charged the department responsible for the defect with the cost of processing the article up to the point it was scrapped. The totals of these slips and the reconditioning charges for the period were also entered against the departments on their cost sheet under the heading "Defective Ware Loss," thus bringing this additional charge to the notice of the executives.

Was the policy of the company in handling the reconditioning charges sound?

What steps would you recommend to obtain a better control of the breakage factor?

Do you think the records maintained furnished adequate information about breakage? If not, what other reports would you suggest?

5. Murray Boot and Shoe Company—No. 2

CONTROL OF WASTE: HOW SHOULD LEATHER WASTE IN A SHOE FACTORY BE REDUCED?

Raw material costs comprised the largest item of total manufacturing cost for the Murray Boot and Shoe factory, sole and upper leather alone constituting as high as 60% of the cost of a pair of shoes. This percentage varied a good deal, due to the fact that leather prices fluctuated severely and with more rapidity than did other items of cost, such as wages, rentals on machinery, and salaries. The fact that only 65 to 70% of the leather issued got beyond first cutting operation, indicated the necessity of close control over materials and waste.

The leather used by this company varied according to the type of shoe made, the part of the shoe it was intended for, and the quality of shoe being manufactured. The average waste varied with each kind of shoe produced. In style shoes for women, for example, the waste in the cutting operation usually ranged 10% higher than in cutting the more conservative and standard shoes for men. This was partly caused by the difference in grain of the lighter leather needed for women's shoes, and partly by the fact that the shapes for the style shoes were more difficult to cut. Some of the staple styles were stamped out by machine, but the larger portion of the styles were cut by hand knife; skilled workmen exercising their judgment as to the best manner in which to cut each skin or hide. Each animal covering differed in size, shape, location and number of imperfections it contained. Consequently, a large waste could not be avoided in the cutting process, but nevertheless an experienced and clever workman could get the maximum amount of shoe leather out of a hide.

Some of the larger pieces of waste leather could be reclaimed by using them for such parts as straps, overlays, appliques and trimmings for fancy shoes, but only the very best remnants were suitable for these purposes. The remaining unusable waste was sold for $10 or $15 per ton to fertilizer producers. These outlets for waste reduced the problem only to a slight degree when the high initial cost of the leather was considered.

The Murray Boot and Shoe Company had prepared forms for the purpose of checking waste in the plant. For each lot of leather purchased, a separate tag was kept which gave the lot number, date of purchase, grade, cost, name of tanner, location of leather in warehouse and footage, amount issued for production, that returned and the balance. In this manner the inventory of leather on hand was kept, and by the use of an Upper Leather Cutter's record (Form 1), the results obtained from each lot could be ascertained. This form recorded the kind of stock and the cutter's name and number. It also contained a description of the leather used, the tanner who produced it, its lot number, footage issued, footage returned, total used, price and the whole stock cost. The grade given by the tanner and that assigned by the company's sorter, who checked each lot received, was also recorded. This information was a check upon the leather entering production, for quality as well as workmanship determined the amount of waste expected.

On the reverse side of this Upper Leather Cutter's record was the Cutting schedule (Form 2), which designated the sizes and parts to be cut. The results of the cutting, however, were recorded on Form 1, which also contained columns for style and parts produced, the cutter's pay, and all particulars pertaining to his production. The estimated footage and value were given for the stock from which the parts were made. Totals were summarized at the foot of the form; the workman's compensation was stated, and the gain or loss on cutting was recorded in physical units. The estimated footage allowance was based upon actual measurements of the patterns to be cut, plus a coefficient or percentage, which was allowed for waste; this latter figure being based upon past records and was no more than a reasonable expectation from a careful workman.

A weekly summary was made of the cutter's reports on Form 3. The footage consumed, the cutting gain or loss, and the estimated gain or loss on the total lot was recorded on this form. So far, these gains and losses had only been given by footage of leather, but on Form 3 they were translated into money values, and, as may be seen, a special section was devoted to inventory data.

Although the waste depended in the main upon the run of a

UPPER LEATHER CUTTER'S RECORD

Stock Cutter's No. Name

Cutter's Pay Coupon	Tanner	Grade		Lot No.	Feet Issued	Returned	Total Used	Priced	Whole Stock Cost
		Tanner	Sorter						
Cutter's No. Amount Date Issued									

	Grade	Style	Parts	Cutter's Pay	Width	Case No.	Pairs	Equation	Base Area	Estimate	
										Ftg.	Value
1											
2											
3											
4											
5											
6											
7											
8											
9											
10											
11											
12											
13											
14											
15				Total Pairs							

Time Out	Base Pay Total Pay Time Worked					Time In	Total Base Coefficient Allowances Used Gain Loss				

FORM 1.

Murray Boot & Shoe Co. No. 2

<table>
<tr><th colspan="31">CUTTING SCHEDULE</th></tr>
<tr><th>Pattern No.</th><th>Wd.</th><th>Grades</th><th>Parts</th><th>2</th><th>2½</th><th>3</th><th>3½</th><th>4</th><th>4½</th><th>5</th><th>5½</th><th>6</th><th>6½</th><th>7</th><th>7½</th><th>8</th><th>8½</th><th>9</th><th>9½</th><th>10</th><th>10½</th><th>11</th><th>11½</th><th>12</th><th>12½</th><th>13</th><th>13½</th><th>1</th><th>1½</th><th>2</th></tr>
<tr><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td></tr>
</table>

Murray Boot & Shoe Co. No. 2

FORM 2.

<table>
<tr><th colspan="16">FOOTAGE RECORD</th></tr>
<tr><th rowspan="3">Week Ending</th><th rowspan="3">Coefficient Made</th><th rowspan="3">Base Area</th><th rowspan="3">Feet Used</th><th colspan="6">Money</th><th colspan="6">Inventory Proof</th></tr>
<tr><th colspan="2">Cutting</th><th colspan="2">Estimate</th><th colspan="2">Substitution</th><th rowspan="2">Voucher No.</th><th rowspan="2">Feet</th><th rowspan="2">Value</th><th rowspan="2">Voucher No.</th><th rowspan="2">Feet</th><th rowspan="2">Value</th></tr>
<tr><th>Gain</th><th>Loss</th><th>Gain</th><th>Loss</th><th>Gain</th><th>Loss</th></tr>
<tr><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td></tr>
<tr><td colspan="2">Cutting Coefficient</td><td>Grade</td><td>Op. Price</td><td colspan="6">Consignor</td><td colspan="6">Stock</td></tr>
</table>

Murray Boot & Shoe Co. No. 2

FORM 3.

particular lot of leather, the executives made use of these forms to ascertain the efficiency of the workmen. If a man fell below the standard allowance, he was called to account for it and, if this happened repeatedly, it was considered grounds for discharge.

Do you consider that this system offered adequate control over waste?

How should the waste leather reclaimed for other parts of the shoe be accounted for?

6. D. A. CHAPMAN AND COMPANY

MATERIAL WASTE: WHAT RECORD SHOULD BE KEPT OF WASTE INCURRED IN THE PREPARATION AND SPINNING OF WOOL?

D. A. Chapman and Company made fine woolen cloth and felts. One of the points to which some attention had to be given was the obtaining of the greatest possible yield from the wool entered into process. Each lot of wool mixed for manufacturing purposes was recorded as follows:

Lot Number
Yarn Production and Waste Report Date Finished

Batch Weight to Pickers........................ ....
Add—Oil Weight............................ ....
Total Weight..........................
Deduct—Fertilizer.................... ....
" —Other Picker Waste........... ....

Net Weight put up to Cards.................... ....
Deduct—Roving Vat Returned................ ....
" —Strippings...................... ....
" —Card Waste...................... ....
" —Burr Wash....................... ....
" —Fertilizer......................... ....
" —Invisible Loss (worked back by Difference)........................ ....

Net Weight sent to Spinning Room (weighed)..... ....
Deduct—Soft Waste...................... ....
" —Hard Waste...................... ....
" —Greasy Waste..................... ....
" —Off Sorts......................... ....

Net Pounds of Spun Yarn.................... ....
Percentage of Total Weight.................. ....
Percentage of Batch Weight.................. ....

On this form the quantities of good wool and waste of different kinds were clearly indicated. The figures reflected in this form required the weighing of waste at more points and more frequently than some executives thought profitable, but the cost of wool and the amount of waste were such that other executives believed that the added attention to this subject was well repaid in the influence it had in giving extra yields from the wool. It was anticipated that, after this record had been kept for some time, it might be possible to discontinue it in favor of a more simple record; this, however, would depend on the results obtained from time to time.

One matter which it was hoped to check was the influence of moisture on the top floor of the mill upon the losses subsequently incurred. On this floor, rovings were sized and, if the humidity conditions were not entirely satisfactory, too much wool was likely to be used in subsequent operations, with a consequent material loss. The question of proper control of the circulation of air, temperature, and humidity was accordingly frequently discussed, and the waste reports should furnish information on this stage of operations.

Would the form illustrated provide the most reliable information on waste?

C. DEVELOPMENT COSTS

1. Barton Corporation

RESEARCH COSTS: HOW SHOULD THE COSTS OF VARIED RESEARCH BE DISTRIBUTED?

The Barton Corporation, an old established firm located in northern New York, manufactured a large variety of fancy paper products and novelties. During its entire existence of over 80 years, the company had enjoyed prosperity and had grown into a large organization, whose products were sold all over the world. The management had always been most progressive in character, the president's point of view being that a business executive should not hesitate to experiment, and to accept new truths if they were proved by the results of such experimentation.

The company maintained a research department which was constantly working on time studies and rate setting, cost research, chemical research, and methods research, each function being carried on by a specially fitted group. The cost of maintaining the research department was a manufacturing expense, but it could not be charged to any particular line of product, nor was it easy to determine a distribution of the research cost among the lines on a basis of benefit received.

The entire cost of the research department was included in General Manufacturing Overhead, and was charged to the productive departments on the basis of the number of employees in them. This had appeared to the management the fairest way of handling research cost if excessive detail were to be avoided. It seemed reasonably satisfactory for most of the functions of the research department, but there was some question as to its applicability in the case of chemical and methods research.

The chemists performed such varied tasks as testing raw materials on their arrival at the plant, testing goods at various stages of completion, testing finished product, and experimenting on new combinations of colors for future use. Since the company carried an account for Purchasing Overhead, it was suggested that the portion of the expense incurred for the testing of raw materials should be charged to this account rather than to General Manufacturing Overhead. Likewise the cost of experimenting on new colors might be charged to Experimental Cost, the absorption of which might be extended over a somewhat longer period than that for General Manufacturing Overhead. The chief difficulty in splitting the cost of chemical research in this way was the determination of the amounts of time spent on each function of the department; to accomplish this accurately, it would be almost necessary to require the chemists to keep Time cards and, for psychological reasons, this would be very undesirable.

Methods research included principally experimentation on new methods for old products, but also a considerable amount of study for the development of new lines. The feasibility of separating these elements was a point of discussion.

What should the cost accountant recommend as a basis for accounting for the chemical and methods research expenses?

2. Ashcraft Stove Company

DESIGN COSTS: HOW SHOULD DESIGN COSTS BE DISTRIBUTED?

The Ashcraft Stove Company figured its costs from estimates based on past experience, following the old rule of doubling direct labor and material costs in order to obtain the selling price. This had been considered sufficient to include manufacturing overhead, selling and designing expenses, and to yield a profit. A change of opinion of some of the owners of the company led to a revision of the cost system, and the cost system recommended by the National Association of Stove Manufacturers had been installed. This system collected direct costs by departments [1] and added a percentage overhead for each department based on past experience. The cost manual of this association stated that new pattern costs should be debited to a Pattern, Flask, and Follow Board account. This account should be depreciated annually and a corresponding debit made to Foundry Expense. The Ashcraft Stove Company, however, did not adopt this method of handling new design and pattern costs.

After the uniform system had been in effect in this company's plant two years, the officials became dissatisfied with the old method of charging off design and pattern costs. In the pattern department nine men were employed; they did nothing but execute the plans of new designs which were drawn up by the president of the company. The annual expenditures of this department varied from $20,000 to $30,000 a year according to the number of new stoves added to the line. This did not include any of the salary of the president, which was $15,000, although he spent much of his time in drawing the plans. Each year two or three new stoves were made. The pattern department made wooden patterns from the drawings submitted by the president and sent them to the foundry. In the foundry, castings were made from the patterns; and these castings, finished and fitted, became the patterns kept for permanent usage. The company had always charged off as expense the total cost of the pattern department each year, without applying any of this cost directly to the stoves. It was the opinion of one member of the firm that some patterns were made up, and a new stove added to the line, the manufacture of which would have been undesirable to continue from a profit standpoint, if its cost had included pattern and design charges. The length of life of a pattern was entirely dependent upon the stove's popularity. Most patterns, however, were used for about 15 years before the style became obsolete; a few were continued as long as 30 years.

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[1] In the stove business the trade custom had arisen to call only four departments direct departments. These were core making, molding, mounting, and fitting. Some factories also considered packing and blacking as direct. The other departments, such as cleaning, pattern making and designing, were considered as indirect.

What method should have been employed by the Ashcraft Stove Company in attaching the pattern costs to the finished product?

3. Melville Food Products Company

RESEARCH AND DEVELOPMENT: HOW SHOULD DIFFERENT TYPES OF RESEARCH COSTS BE DISPOSED OF?

In the process of manufacturing its line of food products, including chiefly relishes and condiments, the Melville Food Products Company had occasion to make extensive use of laboratories, the annual cost of which ran into considerable sums. Most of the work of the laboratory staff was associated with the control of manufacturing operations; the company's standard of quality could be maintained only by continual vigilance, and in many cases the time for transferring goods from one process to another could be determined only by testing, it being impossible to set fixed time limits on these. In addition to these operations for the systematic control of manufacturing, however, a considerable amount of time and attention was given to endeavors to improve the quality of the products.

During 1927 the directors desired to embark upon an extension of the company's manufacturing program, and it was proposed to make extensive experiments with a view to developing several entirely new lines which might be added to the companys' present list of products. At about this time the company went through considerable financial changes, including the sale of its holdings in certain subsidiary companies, the products of which were related to the products of the Melville Company. These financial changes resulted eventually in a large capital surplus in the books of the company, and out of this the directors appropriated a sum approximating $800,000 as a Reserve for Development for new products, regarding this as provision for the proposed expansion of the company's list of products.

Soon after this, an entirely new laboratory was equipped and staffed with additional chemists, though under the supervision of the present chief chemist; it was understood that for some time the activities of this special laboratory would be directed wholly to the development of new products.

At the end of 1927 discussion arose as to the treatment of the various expenditures upon research. It was generally agreed that the amounts spent for current control of manufacturing should, as hitherto, be included in the regular manufacturing burden, but there was some hesitation as to precisely how the new expenditures for development of new products should be set up on the books and shown on the published balance sheet. The new laboratory was situated in buildings already owned, but the new equipment purchased was added to the plant and equipment account. In view of the provision of the directors it was considered natural to charge the current expenses of the new laboratory for salaries, supplies, et cetera, to the Reserve which had been set up, but there was some demur against this on the part of several of the company's officers. It was suggested that the reserve had been set up to indicate the origin and purpose of the funds, more especially to earmark them as being unavailable for dividends, and that it was not necessarily contemplated that the reserve would be consumed as the expenditures were made. If an appropriation of specific funds were made by the directors on the assets side of the books, those funds naturally would be credited and consumed as they were expended, but no such necessity attached to the Reserve account now set up. It was further pointed out that there was no guarantee that the expenditures would result in anything of tangible and substantial value to the company, and if there was any prospect of the amounts having to be written off it was thought unwise to allow too large a sum to accumulate to be disposed of in that way. On the other hand, it was the hope and expectation that definite additions to the line of products would be made as a result of these experiments. Another suggestion made was, therefore, that the expenditures be charged to an Asset account, or at least to a Deferred Charge account; if that were done the expenditures might be shown on the balance sheet as an asset, and on the other side would be the Reserve account showing the origin of the funds for these expenditures, and the amount which was still available for further research and development. The objection to this proposal, however, lay in the fact that the company's balance sheet already contained a very considerable figure for patents, trade-marks, and goodwill, and it was considered undesirable to add further to the volume of intangible assets. Although, therefore, something might be said in favor of showing as an asset anything of capital value which might result from the research work, the idea was overruled in favor of a conservative showing in the balance sheet. It was accordingly decided to apply the total of these expenditures against Reserve for Development, for purposes of balance sheet construction.

It was, however, pointed out that the expenditures need not be made a direct charge to the reserve in the books, but that they might well be charged to a separate account and still be offset for balance sheet purposes. In that way the amounts of the expenditures would perhaps be more clearly apparent, and it would be more possible to subdivide the expenditures as between main lines of investigation and research, if it were possible to differentiate among different products or different methods of research work.

Was the company justified in charging expenditures for development of new products against the reserve set up by the directors?

Was it a wise decision to refuse to set up the new expenditures in the form of additional assets because of the large amount of already existing intangible assets, if the new expenditures were to result in permanent benefit to the company?

4. LeFreer Machine Works

COST OF NEW MODEL: HOW SHOULD THE COST OF A NEW MODEL BE ACCOUNTED FOR?

The LeFreer Company manufactured a variety of electrical machines to be used in manufacturing plants. Progress and change were always taking place in the models which it handled, so that, in order to hold the market, it was necessary for the company to frequently redesign old types, or bring out entirely new machines. The development of the model included all the costs of designing and engineering, of making the detailed drawings, of small tools and patterns used in making the model, and of the expert hand labor involved.

When the model had been adopted and quantity production was ordered from the plant, it became necessary for the several shops to acquire such small tools and patterns as would enable them to handle the new model.

The company had one account for Manufacturing Overhead, and another account for Commercial Overhead.[1] When it was added to manufacturing cost, the total commercial cost was obtained. It was contended by some that the cost of development should be charged to Commercial Overhead on the ground that it was a cost of retaining the market. Other members of the staff wished to include it in Manufacturing Overhead; and still others recommended that the expenses be set up as an asset to be charged off to the machines of that model which should be subsequently produced. The last named group said the cost of new models was akin to obsolescence, in that it was intended to prevent obsolescence in the product.

It was generally recognized that the costs of equipping shops with new tools and patterns for quantity production of the new model should be treated differently from the expense of developing it. It was believed that if these expenses of providing new tools for quantity production were charged to the factory overhead, the factory executives would be more economical in their orders for this new equipment. On the other hand, it was desired to afford as much incentive as possible to the factory workers to devise new methods of cheapening the output.

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[1] The latter included selling and administrative expenses, and even some of the indirect manufacturing expenses, which it was thought could be distributed more accurately in this manner. The commercial overhead was distributed on a product basis.

Another consideration was the necessity for having the asset accounts reflect the total value of equipment on hand, with a subsidiary inventory to supply the details for the purpose of providing adequate insurance data.

What disposition of these two classes of expense do you advise?

5. North Eastern Gas and Electric Company

INSTALLATION COSTS: WHAT METHOD SHOULD BE USED IN FINDING THE COST OF APPLIANCES THAT MUST BE INSTALLED?

The North Eastern Gas and Electric Company was engaged in the sale of gas and electrical appliances. It handled several lines of appliances, as well as several makes within some of the lines. Most of the appliances that they sold had to be installed on the purchaser's premises, which entailed labor, hauling, and the use of installation materials.

The auditing department desired to know, at least once each month, what the profit or loss had been for each of the various classes of appliances. As there was a number of salesrooms scattered over the territory served by the company, it also desired to make monthly comparisons between the operations of the different salesrooms and between different sales persons.

The method used to get this information was as follows. The merchandise handled by them was divided into commodity classes and to each class was assigned a code number. Sales locations were also given a code number. All Sales tickets were marked with these code numbers and then sent to the tabulating department, where Hollerith cards were punched in order to obtain a distribution of sales by commodity and location. The aggregate of those tickets represented a charge to Accounts Receivable and a credit to Merchandise Revenue.

On merchandise not requiring installation on customer's premises, the "cost of goods sold" was secured by keeping a Purchasing record for each commodity class.

Those commodities requiring installation such as gas ranges and water heaters were handled in a different manner. In these cases the article was drawn from stock and priced at cost by the general storeskeeper, who maintained a Perpetual Inventory Record. The cost of the merchandise was charged against the commodity and sales location codes shown on the Sales ticket. The cost of installing the appliances was kept by classes and charged against the corresponding codes for commodity and sales location. The net sales less the cost of merchandise sold and installation cost gave the "Gross Profit on Merchandise Sales."

All selling and general expenses were applied directly against the commodity and sales location codes whenever possible. Expenses which could not be charged directly were accumulated at the end of the month and then apportioned on the basis of net sales.

In view of the fact that public utility companies sell appliances for the purpose of increasing the "load" as well as for the profit, was the North Eastern Gas and Electric Company justified in adopting such a complex accounting system to determine the profit made on each type of appliance?

D. BURDEN DISTRIBUTION PROBLEMS

1. Builders Supply Company

FIXED CHARGES: UPON WHAT BASIS SHOULD FIXED CHARGES BE ALLOCATED TO THE VARIOUS MONTHS?

The Builders Supply Company was the operating unit of a large holding corporation which sold chiefly to retailers and small contractors who were engaged in residential work. The business of the concern, as would be expected in catering to that trade, had a pronounced seasonal trend, the peak of its sales and production coming in the spring and summer months, while operations were comparatively slack in the fall. The company, therefore, in order to even out to a certain extent the work in the factory, made all the repairs and replacements to the plant and equipment during the quiet season.

By this policy large maintenance and repair bills were concentrated during the slack months, in addition to the regular fixed charges, which materially reduced the profits of those periods and at times caused a loss to be shown on operations. Because of this condition, the president of the operating company had been criticized by some of the directors of the holding corporation, who held their positions by virtue of stock ownership, and although he had explained the reason for the occurrence yet they believed that the profit for the different periods should be approximately proportional to the sales made.

The president recognized that to meet the wishes of the board of directors, expenses would have to be allocated to the different periods approximately in proportion to the sales of those periods. Such a procedure was not commonly carried out in accounting work, but as he considered the problem he came to believe that the method was, on the whole, correct; for if a machine costing $1,000 would make 1,000 parts, each piece presumably should carry $1.00 of the cost of the machine, no matter when the production of the parts took place. Similarly, the plant and equipment was maintained for the total production of the company and therefore each "unit of production" ought to bear its proportionate share of the entire cost. On the basis of this reasoning, the president decided to revise the method of handling those items of cost which would be affected by such a policy, and instructed the controller to distribute the budgeted expenditures for depreciation, maintenance, and fixed charges between the months of the coming year in proportion to the production for those months during the past year.

This change in the cost procedure led to the accumulation of reserves during the busy season for the different expenses that had been allocated. These reserves were then debited when the bills were paid, or, as in the case of maintenance and repairs when the actual work was done. The method, of course, brought about the condition desired by the directors of the holding company, in that the profits were now shown throughout the year as approximately proportional to the sales of the different periods, but to the president the most valuable feature of the system was the perspective which it gave him of the expected outcome of operations for the year. Each month now carried approximately its share of the expenses of operation of the business, and thus, on the basis of the results of the current periods, the final profits for the year could be estimated without having to consider the effect of large expenditures during the slack season.

Do you consider the president's theory relative to the allocation of the charges sound?

Should he have carried his method a step further and allocated sales and administrative expense on the same basis?

Do you believe that the results obtained were beneficial in giving a perspective of the year's business in advance?

2. Royal Gas Company[1]

HOUSE-HEATING COSTS: ON WHAT BASIS SHOULD GAS COMPANIES ACCEPT HOUSE-HEATING BUSINESS?

The Royal Gas Company, in common with other concerns in the industry, was facing the problem of deciding on what basis it could advantageously accept house-heating business, which presented to it the best opportunity of increasing its sales of gas.

House-heating by the use of gas was being developed in certain localities, but the additional problem of a heavy peak load which might be developed by taking too much of this business made many companies hesitate to enter the field. The peak load of companies with regular domestic business comes during the summer months, and although it was generally admitted that a house-heating demand which would utilize excess equipment in the winter time could be profitably accepted at a low rate, yet concerns were afraid that the new winter peak which might be developed would be far in excess of the maximum summer demand.

On the other hand, the amount of such business that could be obtained was limited. The use of gas for heating was definitely a luxury under the most advantageous conditions, and only those who could afford to pay for it as such could be expected to put in a gas installation.

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[1] Adapted from "What the House Heating Business Means to the Gas Company," by P. M. Wentworth, Haverhill Gas Light Company, *American Gas Journal*, October 14, 1926, pp. 434–439.

In the discussion of the problem throughout the industry, two views were upheld as to the manner in which manufacturing charges should be distributed to the house-heating business. Some companies maintained that a proportionate allocation of the costs of operation should be made between the house-heating business and the regular gas business. The charge for gas obtained on this basis would be high, which would probably keep the winter load below the summer demand, thus carrying it as profitable off-peak business. On the other hand, many concerns favored the development of house-heating on a large scale, and it was recognized that in order to do this the gas rate would have to be reduced below any figure which could be obtained on a proportionate allocation of costs. The effect of this proceeding in some cases had been the development of peak loads in winter far beyond the original summer demand, creating a condition in which a large volume of business was not carrying its legitimate costs, causing an undesirable situation. No single solution to the problem would meet all requirements, as the most advantageous arrangement for any one company would depend entirely upon the economic conditions in the community in which it operated.

The attitude taken by the management of the Royal Gas Company was that if the income from sales of gas for house-heating purposes would more than pay for the specific additional costs incurred in making them, and thus add to the net profits of the company, then the business could be considered desirable. On this basis the company had started three years earlier to sell gas for house-heating at 75 cents per thousand cubic feet, experience in the industry indicating that in order to develop any volume of sales a price of between 75 and 85 cents per thousand cubic feet was necessary. The result was that on January 1, 1926, 110 house-heating installations were in use. That the business had been profitable up to that time was undoubtedly true, for it had been carried as an off-peak load. But what the company wished to know was what the results would be when the house-heating field became relatively as saturated as the present domestic gas business.

The first step in the solution of the problem was to make an estimate of the house-heating business available in the territory and during the period necessary to develop it. A survey made by the company, which based its calculations on the number of people having incomes of $5,000 and over, and on a general knowledge of conditions in the community, indicated that the relative saturation point would be reached by January 1, 1935, with a total of 500 installations using approximately 250,000,000 cubic feet of gas per year. With this forecast as a basis, it was then decided to develop a schedule which would indicate the profitableness of the house-heating business to the company under the final conditions.

On the basis which the company had established for considering the business desirable, namely, that the revenue received from it should more than cover the additional expenses of rendering the service, a determination of the final status of the business required a consideration of the increment costs that would be incurred up to January 1, 1935. In order to clarify the problem, it was decided to show the development of the house-heating business as if it was to be handled by a separate company. This company was to be charged with all expenses necessary for rendering the service which the regular gas business would not have had to incur, and it was to receive the entire income from the sales of house-heating gas. Any additional funds which it required to develop the service it was supposed to be able to obtain from some other source. At the end of the period the parent company was to take over the house-heating business, and if it was shown that this transfer would be profitable then it was considered that the house-heating business would have been advantageous.

INCREMENT COSTS—DIRECT

MATERIAL

The largest item of direct expense to be considered was for materials used in the generation of gas. The experience of the company for the four months, November, 1925, to February, 1926, inclusive, was used as a basis for this charge. During this period the cost was 34.8 cents per thousand cubic feet for the boiler fuel, generator fuel, and the purification materials used. The value of the residuals produced amounted to 2.6 cents, which, when deducted from the gross material cost, gave a net cost of 32.2 cents per thousand cubic feet. This figure was considered satisfactory as there was no reason to expect an increase in the efficiency of the gas production processes.

PLANT LABOR

In order to determine the amount of additional plant labor required in 1935, the plant which would be in operation at that time would first have to be estimated, both as it would have been for the domestic gas business alone and then as it will be for the increased load due to the house-heating service.

The amount of equipment required by a company depended largely on the maximum output which it had to produce, generally calculated on a day basis. Without the house-heating load, the company estimated that in 1935 it would have had to produce 77,100,000 cubic feet of gas to meet the demand during the maximum month, which on the basis of its experience would indicate a maximum day of 3,090,000 cubic feet. The company considered its existing plant, what it probably would have installed by 1935 if no house-heating business were undertaken, and the additional equipment necessary to handle the house-heating gas. With 500 house-heating installations, a maximum month of 126,200,000 cubic feet was expected, with a maximum day of not less than 5,060,000 cubic feet. The house-heating load factor was poor, and sufficient experience had not been accumulated on which to make an entirely reliable estimate; but any reasonable variation from the figure taken would not affect the results of the study. These facts, however, permitted them to make the plant estimates shown later.

The necessary additional labor on the basis of these two setups would consist of generator house labor, purification labor, and generator maintenance. The estimated additional cost amounted to $8,100 per year, which, on the basis of 250,000M cubic feet of gas, gave a charge of 3.2 cents per thousand. To cover additional supervision, coal handling, and plant engineering charges, a further allowance of 2.4 cents per thousand seemed sufficient.

To handle the increased load, it was estimated, as shown later, that the distribution system would need to be increased 10%, and it was assumed that the expenses of distribution would be increased proportionately, giving a charge against house-heating gas of 1.5 cents per thousand.

INSPECTION AND SERVICE

The cost to the company up till 1926 for regular boiler inspection and service calls had amounted to 3.1 cents per thousand cubic feet. This charge was considered too high, and it was thought that with 500 installations the service could be far more efficiently organized, reducing the cost to 2 cents per thousand, and lower if necessary by placing service calls on a charge basis. This last arrangement it was not wished to introduce unless necessary, as it would not go well with sales talk to prospects.

COMMERCIAL EXPENSE

The current cost to the company for reading meters and billing was about $2 per customer for all sales. On this basis the charge against house-heating gas would be 0.3 cents per thousand for a nine months period. The cost would probably be somewhat larger because of the special conditions of reading and billing for this service, but not sufficient to warrant any adjustment.

NEW BUSINESS EXPENSE

The sales expense of obtaining new business had up until 1926 been more than covered by the mark-up on the equipment sold. However, with an expected sales volume of only 40 new installations a year there would be an estimated deficit on sales activities of about $1,000. In order to meet this deficit, the company was considering increasing the price of house-heating equipment 10% over the list price for which it would install the boilers. This additional income would also cover the sales deficit and would not, in the opinion of the executives, result in any lost sales. The management did not consider it reasonable in any event that a charge should be made against the rate to cover the cost of getting new business.

LEAKAGE

In the distribution of gas there was always a certain amount of leakage from the mains, which was determined by metering the gross amount of gas sent out from the station as compared with that used by customers. The company had experienced about 7.5% leakage on the basis of its output of 600,000M cubic feet, and with about a 10% increase in the length of its mains it was thought that leakage would increase a proportional amount, or to 8.25%. Thus, on an expected sendout of 1,135,000M in 1935, leakage would amount to 93,637,500, of which 8,512,500 would be chargeable to house-heating. This amount, when applied to 250,000M cubic feet of gas, gave an addition of 3.4% to be applied to fuel and generator labor, which amounted to 1.5 cents per thousand cubic feet.

SUMMARY OF CHARGES

The following table is a summary of the estimated increment direct costs per thousand cubic feet which would be incurred in producing gas for house-heating purposes in 1935:

	Cents
Fuel, etc., less residuals	32.2
Purification labor and generator maintenance	1.3
Operating labor	3.2
Miscellaneous labor and overhead	2.4
Distribution labor	1.5
Inspection and service	2.0
Commercial expense	.3
Leakage	1.5
Total	44.4

OVERHEAD

In the consideration of this part of the problem, the additional plant and equipment which would be required because of the house-heating business, over and above what the regular domestic business would have used, was estimated for each year, and the charges on this additional equipment allocated against the house-heating division, thus carrying out the supposition that the business was to be carried on by a separate company.

In order to determine the additional plant and equipment, it was first necessary to estimate for each year the maximum day's demand which the company would be called upon to supply. With the domestic business alone, the maximum days would have come in September, but, when combined with the house-heating load, they would have occurred in January. The estimates made in thousands of cubic feet, were as follows:

	Domestic Business	With House-heating
1927	2,080	2,600
1928	2,190	3,000
1929	2,300	3,200
1930	2,400	3,570
1931	2,530	3,850
1932	2,660	4,150
1933	2,830	4,450
1934	2,960	4,470
1935	3,090	5,060

From these estimates it was determined when new units would have to be added to the plant and in this way, the Construction Budget, which follows, was developed.

Construction Budget

	Plant Equipment	Holders	Mains	Service and Meters	Total	Cumulative
1924	$ 0	$ 0	$ 0	$ 4,350	$ 4,350	$ 4,350
1925	0	0	0	9,050	9,050	13,400
1926	0	0	3,000	6,800	9,800	23,200
1927	225,000	200,000	5,000	6,200	436,200	459,400
1928	....	135,000*	10,000	5,600	119,400*	340,000
1929	....	0	15,000	5,000	20,000	360,000
1930	....	0	16,000	5,000	21,000	381,000
1931	....	0	16,000	5,000	21,000	402,000
1932	225,000	0	16,000	5,000	246,000	648,000
1933	225,000*	0	16,000	5,000	204,000*	444,000
1934	0	0	16,000	5,000	21,000	465,000
1935	120,000* 24,400	....	....	....	95,600*	369,400
	$129,400	$ 65,000	$113,000	$62,000	$369,400	

* Credit.

In the first four columns of this table are recorded the amounts which it was estimated the additional units required for the plant and distribution system would cost. The credits in the first two columns indicate that because of its growth the domestic business alone would have required additional plant capacity at these points, and therefore, it assumed the charges on such increases which, up until that time, had been carried by the house-heating division.

PLANT EQUIPMENT

The first column shows that because of the growth of the house-heating business it would be necessary in 1927 to replace an 8-foot 6-inch set[1] with an 11-foot set at an estimated cost of $225,000, and this same procedure would have to be repeated again in 1932, or at that time, merely the addition of an 11-foot set might have been made. In 1933 it is seen that the domestic business itself would have required the replacement of the first set; so it assumed, by the credit shown, the costs of carrying one set. The credit was given in full as the reserve for depreciation which had been accumulated on the property was kept intact and later turned over to the company.

In 1935 when the house-heating business was to be taken over by the parent company it still had charged to it an 11-foot set which cost $225,000. Without the additional business there would have been in place of this set an 8-foot 6-inch set which would have been 20 years old. The estimated cost of replacement of such a set was $150,000 and on the basis of a 25-year life, the company would have charged off $120,000 of this. Therefore, it was considered correct that the parent company should assume the proportions of the cost which would be the equivalent of a new 8-foot 6-inch set and accept a charge of $150,000. However, on a replacement basis, it still would have had on its books $30,000 from the old set which reduced the credit to the house-heating investment to $120,000. This condition gave the house-heating business the benefit of cheap producing capacity, having the last 1,700M cubic feet capacity of a 3,300M cubic foot generator allocated to it. However, the maximum day in 1935 had an output of 1,960M cubic feet for house-heating which is more than the excess capacity of 1,700M assigned to the house-heating and, therefore the latter business should carry a proportionate charge of the remaining capacity (3,300M–1,700M) of the generator it uses, or $\frac{260}{1,600}$ of \$150,000, which equals \$24,000, giving the last charge shown in that column.

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[1] A set included the gas producing retort and the auxiliary equipment which was used in its operation.

HOLDERS

The second column of the table shows that a new holder would have to be installed in 1926 because of the house-heating load. Under the expected conditions it was believed that a 2,000,000 cubic foot holder at a cost of \$200,000 would prove most economical. The domestic business alone would have required a new holder in 1928, but probably one of a 1,000,000 cubic feet capacity would have been installed as it would have handled the load for ten years more. This holder would have cost \$135,000, which, therefore, would become a credit against the original charge made to the house-heating business. This condition would give the house-heating business the benefit of exceptionally cheap storage capacity, but would not charge the regular business with anything more than it would ordinarily have to carry.

STREET MAINS

The estimated cost of increasing the capacity of the distribution system was allocated to the different years to correspond with the increased load to be carried. The total expense of \$113,000 was approximately one-tenth of the cost of the present distribution system. This amount seemed adequate as an investigation showed that a number of representative gas companies had been able to double and sometimes triple their distribution capacity for a similar percentage of increased investment. Further, it was only necessary for the company to obtain an increase of 55% in distribution capacity and a rough check on the cost of the high-pressure system indicated that out of the \$113,000 there would be \$57,000 left for strengthening the low-pressure mains, which appeared to be ample.

SERVICES AND METERS

The charges in this column were based on the actual costs that had been incurred over the past years and which amounted to $89 for each service and $35 for each meter in place. These amounts, multiplied by the number of customers it was expected would be obtained, gave the charges shown.

BUDGET TOTALS

The total column shows for each year the net amount of money which was to be expended for plant additions. In some cases, however, there is a credit to the house-heating investment when the parent company takes over part of the installation. The "Cumulative" column shows the amounts which the house-heating division will have borrowed each period to carry out their program of development. The cost of carrying these amounts will be considered in the next section of the case.

FINANCIAL BUDGET

After estimating the new plant and equipment required and the extra operating expenses, the financial program for the period was made out. It is shown on the next page.

In column "*a*" the yearly revenue expected from house-heating sales is given. The first two columns under "*b*" show the estimated operating expenses for the different years. In the next column is given the interest charge at 8% on the money borrowed, while in the last column are shown the charges for depreciation and taxes, 3% each, a total of 6% on the investment in the plant.

The net balance of the revenue and expense is given in column "*c*." The amounts shown as required each year for new plant were taken from the Construction Budget and these amounts added to those shown in column "*c*" give the cash required for each year, from which the cumulative cash requirements were obtained.

It is seen from the table that on January 1, 1935, the house-heating division would have a net investment in plant of $369,400 and that the money it would have borrowed at that time would

FINANCIAL BUDGET

	a	b				c = a − b	d	e = d − c	
	House-heating Revenue	Regular Costs	Added Operating Costs	Interest at 8%	Depreciation and Taxes at 6%	Balance	New Plant	Cash Required for Year	Cumulative Cash Require-ments
1924	$ 3,850	$ 1,855	$ 0	$ 0	$ 0	$ 1,995	$ 4,350	$ 2,355	$ 2,355
1925	23,600	11,680	0	188	261	11,471	9,050	2,421*	66*
1926	48,000	23,700	0	5*	804	23,501	9,800	13,701*	13,766*
1927	61,800	30,600	0	1,100*	1,392	30,908	436,200	405,292	391,526
1928	81,700	39,800	2,150	31,300	27,600	−19,150	119,400*	100,250*	291,276
1929	97,500	48,200	3,900	23,302	20,400	1,698	20,000	18,302	309,578
1930	112,500	55,700	6,000	24,766	21,600	4,434	21,000	16,566	326,144
1931	127,500	63,000	8,500	26,092	22,850	7,058	21,000	13,942	340,086
1932	142,500	70,500	11,200	27,207	24,100	9,493	246,000	236,507	576,593
1933	157,500	77,800	12,400	46,127	38,900	−17,727	204,000*	186,273*	390,320
1934	172,500	85,200	13,580	31,266	26,650	15,844	21,000	5,156	395,476
1935	187,500	111,000†	....	....	....	....	95,600*	95,600*	299,876
	....	....	....	....	184,567	....	369,400	299,876	

* Credit.
† Total, including Added Operating Costs.

be $299,876. This amount, therefore, is what the parent company would need to raise in order to take over the business, and it was thought that it would be best to obtain it through the sale of stock.

In the locality in which the company operated, the stock of a number of gas companies was selling around $47 to $50, on a $25 par value. It was, therefore, considered advisable to offer the issue to the stockholders at $35 a share, which would make the stock rights of material value. In order to raise the required amount and cover the selling expenses, it would be necessary to sell 9,000 shares, which would by no means overcapitalize the additional plant obtained. The market value of the stock was to be maintained by putting the shares on a $2.50 dividend basis. The financial returns of the house-heating business to the company in 1935 may then be summarized as follows:

Sales (250,000M cu. ft. at 75 cts. per M.)	$187,500
Less: Operating expenses (250,000M at 44.4 cts.)	111,000
Balance after operating expenses	$ 76,500
Dividends on stock, 9000 shares at $2.50	$ 22,500
Depreciation charge, 3% of $369,400	11,070
Taxes at $30 per thousand	11,070
Available for surplus	31,860
Balance after operating expenses	$ 76,500

This result, therefore, shows that the business might be considered advantageous from the standpoint of the gas company.

An analysis of the whole problem revealed that the favorable showing made by the house-heating business was due to three factors. First, the gas company at the beginning had considerable excess generating capacity which the house-heating business was able to utilize at a small cost to itself for the first four years. Such a situation probably would not have occurred in all companies, but on the other hand, no company used to capacity all its plant and equipment, and if it did, the condition would soon have changed by the addition of new units; the house-heating business would have then gained, but at a later date. In the second place, the additional distribution capacity necessary could be obtained at a comparatively small cost, which materially lightened the overhead burden that had to be carried by the new business. The third factor was the relation between the growth of the house-heating business and the domestic gas business. At first, the house-heating was carried as an off-peak load, then as the relative loads increased, the new business required a certain amount of additional plant facilities, but not enough to load it heavily with fixed charges. The condition thus developed was such that the company had an excess capacity during the summer months which it was advantageous to utilize by developing an off-peak load at a low price and thus the company would be selling off-peak gas throughout the entire year.

There were two conditions related to the business which it appeared advantageous that the company control. First, was the consideration of the type of heating installation that would be most favorable. From the experience that had been gathered, it seemed that steam installations were to be preferred to hot water heating, because of the hourly load characteristics of the two types. Sufficient experience with hot air had not been obtained to know whether it was as desirable as steam or not. As a second condition, it was recommended that the agreement with all users should call for maintaining their houses at a constant temperature. Although this arrangement would probably cause an increase in the amount of gas consumed, yet because of better load characteristics it was expected to reduce the total gas bills of the different customers.

Do you approve of the apportionment of charges here suggested between regular and house-heating business?

Assuming that leakage was in proportion to length of main and pressure in the main, was the figure for leakage correctly computed?

3. Homemade Bread Company

EXPENSE ALLOCATION: HOW SHOULD EMPLOYEE-WELFARE EXPENSES WHICH FACILITATE BOTH ADVERTISING AND PRODUCTION BE DISTRIBUTED?

Upon the formation of the Homemade Bread Company, a comprehensive publicity program had been developed by which the firm sought to gain the interest and patronage of the people in the metropolitan district which it served. The factory and grounds were maintained in excellent condition, and visitors who wished to go through the plant were always welcomed. Newspaper advertising was carried on extensively, and one type of copy frequently used to gain "human interest" told of special activities which were carried on by the company.

In connection with this advertising program, the liberal labor policy of the firm was continually featured. The wages paid to its employees were as high as the average that could be obtained in the district where the plant was located. In addition, the firm aided its workers to such an extent in other ways that it had become known as a "good place to work" and there was always a long waiting list of people wishing employment.

Foremost among these special activities was the free lunch served on the five full working days of the week to all the employees in the plant. This lunch cost the concern from 30 to 35 cents per person and as there were from five to six hundred people in the shop the provision of this meal proved to be an expensive item. In the line of eductational work, the company provided, free of charge, a teacher for any group of fifteen or more employees who requested instruction in a particular subject. A large auditorium was maintained for the use of the workers, where they could put on any entertainments or social functions they desired, and the company had arranged for a weekly moving-picture program which was given free to the employees and their friends. Outdoor sports were encouraged by the firm, and a recreation ground with facilities for several games had been provided close to the factory.

As has been suggested, the development of this policy had proved very beneficial to the company in maintaining satisfactory relations with its labor force. The firm was able to obtain the highest grade of help from the many applicants who wished employment, and those selected, because they knew that they were competing to hold their positions, maintained a high degree of efficiency in doing their work. Difficulties between the employees and the company were practically unknown, and the labor turnover was so small as to be negligible. These conditions were considered so advantageous by the management that even if the publicity feature were to be eliminated the special activities would still be carried on. For this reason, therefore, the treasurer felt that the shop should be charged with these extra expenses, although the program had been developed for publicity purposes and the costs had been hitherto charged to a special advertising appropriation.

If this disposition of the expense was decided on, there were two ways in which the costs might be considered. First, they could be charged to the different departments as a part of the direct labor cost, or second, they could be handled as a portion of the indirect labor expense. The treasurer maintained that "in effect" the cost of these activities was just as much a part of the wages of the employees as the money paid to them, and as such should be considered a direct labor expense. The controller, on the other hand, believed that actual wages paid were the only items that could be considered as direct labor costs and thought that these additional expenses should be classified as indirect charges.

The foremen in the shop, however, were opposed to this arrangement. They conceded that the employees were probably more efficient and did better work because of the program carried out but believed that just as beneficial results, from a production standpoint, could have been obtained with less expense by a moderate increase in wages. They, therefore, argued that it would be unfair to charge the factory with the total cost of these activities.

It was also pointed out that there was a real publicity value in the program that had been developed, and therefore the advertising department should bear some of the costs, even if the rest should be charged to the factory. The difficulty in making an arrangement of this nature appeared to be in obtaining a reasonable distribution of the expenses, as there was apparently no base upon which a relative evaluation of the benefits accruing to the two divisions of the organization could be determined, and therefore, an arbitrary breakdown of the expense would have to be made.

What division of the organization should carry these expenses?

Considering that the expenses should be handled as labor charges, should they be classified as direct or indirect expenses?

What basis would you suggest for an allocation of the costs between the advertising department and the shop?

4. Peters Food Products Company

EXPENSE ALLOCATION: UPON WHAT BASIS SHOULD SPECIAL PLANT EXPENSES BE ALLOCATED TO THE VARIOUS FUNCTIONS OF THE BUSINESS?

The plant of the Peters Food Products Company had been built in one of the national tourist centers on the western coast. This location had been selected with the express intention of developing a widespread customer patronage and goodwill by the use of the advertising feature of showing travelers through the factory, in which facilities had been incorporated to aid in carrying out this program. The firm, as a result of this policy, regularly incurred many expenses which could not be considered normal in the operation of a business, and the management felt the necessity of making a correct allocation of these additional costs.

In order to give visitors a favorable impression, the company had constructed its office and factory building of ornamental brick, and had gone to considerable expense in developing attractive grounds around the plant. Upon entering the building, people found themselves in an elaborate foyer, where a hostess welcomed them, and, after registering, they were divided into parties for a tour of the plant. This trip lasted a little over half an hour after which the visitors were served a luncheon made up of the company's products in a special dining room arranged for that purpose.

The maintenance of this program proved to be a large item of expense for the concern, as well over one hundred thousand people were taken through the plant annually, which required the services of twenty or more employees as guides during the rush season, in addition to the cost of the luncheon and the upkeep of the special rooms, building, and grounds. This expense had been charged directly to the advertising budget, but the manager of that department objected to the procedure because the directors of the company gave instructions that the program should be carried out, and thus he had no control over the expenditures which he believed could be better utilized in other ways. He admitted that a direct contact with prospective customers was obtained by this method, but he also pointed out that the cost per person reached was much higher than for other forms of advertising, and, further, he thought that many visitors were already customers of theirs and that others were interested only in seeing the plant and processes and not in the products. On the other hand, it was argued that a person shown through the plant would probably tell others about the experience, so that a more direct contact would be made with several people through one visitor than could be obtained by ordinary means of advertising.

One method suggested for handling this expense was that the whole amount should be charged to the General Overhead account. As justification for this procedure, it was argued that, as the company had from the beginning definitely planned on carrying out this policy, it could be considered as one of its regular expenses of doing business, and as there was no proof that beneficial results were obtained from the scheme it was not right to penalize the advertising department with its costs. Further, many concerns had developed the practice of showing visitors through their plants, and maintained, as a matter of business policy, good-looking buildings, reception rooms, and well-kept grounds, so that a portion of the expenses did not seem to be abnormal. If the costs were included in the General Overhead, they would be considered of the same general nature as the expense of social service and employee welfare work which companies are not required to do but which they consider advantageous to carry on.

This plan was objected to on the grounds that the program was primarily being carried out for advertising purposes and that the cost should therefore be charged to that division of the accounts. In order to overcome the objection of the advertising manager, it was recommended that the board of directors make a special appropriation to meet these expenses, and that, in the financial statements that were made up, this appropriation could be correctly included as one of the items of the advertising costs. The manager was willing to accede to this arrangement, but still did not consider that all the costs should be charged to the appropriation, as he believed some of the expenses should be regarded as normal in the operation of the business.

The controller, after studying the problem, also thought that an analysis of the cost should be made, and suggested that the total expense be distributed in three ways, among the General Factory Overhead, the General Administration Expense account, and the advertising appropriation. He believed that the Factory and the General Administration Expense accounts should be charged with a portion of the cost of the upkeep of the building and grounds because the expense of doing the work was not materially greater than would normally be incurred in the case of an ordinary factory building. The office also benefited because the foyer, although far more elaborate than would ordinarily be required, served as a reception room for both visitors and people making regular business calls. If this method were used, the advertising appropriation would be debited with the costs remaining after the other two accounts had been charged with a fair proportion of the expenditures from which they benefited, but the difficulty in carrying out this procedure was the determination of a basis on which to allocate the expenses.

In what manner should these expenses be distributed?

5. Jameson Manufacturing Company

EXPENSE CONTROL: WHAT ORGANIZATION WILL BE EFFECTIVE FOR THE PURPOSE OF REDUCING THE EXPENSES OF A MANUFACTURING COMPANY?

The Jameson Manufacturing Company had all its productive capacity devoted to military equipment during the war, so that upon the return of peace it was faced with the necessity of building up new products, and of keeping expenses down to a minimum. The accounting procedure and organization were built around a policy of constant vigilance in this respect, and the president, while giving his main effort to the development and sale of new products, exerted strong pressure upon all officers in the direction of expense reduction.

EXPENSE MANAGER APPOINTED

This policy was reflected in the appointment of an expense manager, a staff officer acting directly under the authority of the president, and having a power of veto upon all new expenses at the time when they were first proposed, as well as the duty of scrutinizing all current expenses. An Expense Statement (Form 1) was prepared monthly for each department, and submitted to the superintendent of the plant, to the controller, and to the expense manager. Prominent features of this statement were the actual monthly burden amount calculated as a percentage of direct labor, and the amount of burden over- or under-absorbed by production, charged at the standard rate. On every occasion when there was any substantial amount of under-absorbed burden, the superintendent would investigate the department in which it occurred.

The control of expenses was further promoted by the use of Form 2, a statement showing the costs and profits on goods manufactured during the month, and of Form 3, which broke down by lines some of the totals contained in Form 2. These statements brought to light every month the variances from normal costs in every phase of the company's operations, in a way which could not fail to impress all concerned.

The expense manager had operated for several years with considerable success. He was a tactful and considerate man, who sought to avoid any appearance of arbitrary dictation. Whenever question arose as to any item of expense, it was always put to the manager, who proposed it in the form—"Would you spend this money in this way if the department were your own business?" It was well understood that, in the event of their failing to agree, recourse might be had to the president, who would support the expense manager in all reasonable efforts to keep down expense, so that such appeals were in fact extremely rare. Operating managers found in the expense manager a man with whom they could discuss their problems constructively, with a view to getting better results at less cost. In the maintenance department, for example, a saving was effected by employing fewer men of higher type, and by a redistribution of work among them. Another question arose as to the wages

DEPARTMENT EXPENSES

Month of 192

	Items	This Month		Same Month Last Year		This Year to Date		Last Year to Date	
		Amount	Per Cent	Amount	Per Cent	Amount	Per Cen t	Amount	Per Cent
1	Direct Labor								
2	Supervision								
3	Factory Clerical								
4	Indirect Labor								
5	Repairs and Maintenance								
6	Reclamation of Errors								
7	Supplies								
8	Tools								
10	Rental								
11	Water								
12	Power—Steam								
13	Power—Electric and Air								
14	Gas Producers								
15	Fuel								
21	Change in Manufacture								
24	Divisional Expense								
26	Cartage								
80	Revenue (Red)								
	Total Expenses								
	Standard Overhead								
	Unabsorbed Overhead								
	Direct Labor								
	Specification Labor								
	Excess Direct Labor (1)								
	Spoilage (Scrap) (2)								
	Manufacturing Losses (1 and 2)								

Jameson Mfg. Co.

FORM 1.

MANUFACTURING STATEMENT

Showing Factory Production at Cost and Selling Value and Estimated Gross Profit; Also Accounting for Material, Labor, and Overhead Charged during the Periods under Review Month of 192

	Items	This Month		Same Month Last Year		This Year to Date		Last Year to Date	
		Amount	Per Cent	Amount	Per Cent	Amount	Per Cent	Amount	Per Cent
	Estimated Profit on Production:								
1	Selling Value								
2	Inventory Value								
3	Specification Loss								
4	Specification Cost								
5	Cost Variance								
6	Total Cost								
7	Gross Profit on Production								
	Material Burden:								
8	Total Material Burden								
9	Absorbed Material Burden								
10	Unabsorbed Material Burden								
	Direct Labor:								
11	Total Direct Labor								
12	Specification Labor								
13	Excess Direct Labor								
	Overhead:								
14	Total Overhead								
15	Standard Overhead								
16	Unabsorbed Overhead								
	Manufacturing Loss:								
17	Excess Direct Labor								
18	Spoilage (Scrap)								
19	Total Mfg. Losses								
20	Mfg. Allowances Absorbed								
	Cost Variance:								
21	Mfg. Losses Not Absorbed								
22	Excess Material Cost								
23	Total Cost Variance								
	Specification Charges:								
24	Specification Material								
25	Specification Labor								
26	Standard Overhead								
27	Manufacturing Allowances								
28	Inventory Reserve								
29									
30	Total Specif. Charges								
31	Percent Operated								

Jameson Mfg. Co.

FORM 2.

STATEMENT OF COST VARIANCE Month of 192

	Items	This Month		Same Month Last Year		This Year to Date		Last Year to Date	
		Amount	Per Cent	Amount	Per Cent	Amount	Per Cent	Amount	Per Cent
	F-Tools:								
1	Excess Direct Labor								
2	Spoilage (Scrap)								
3	Mfg. Loss								
4	Deduct: Mfg. Allowance								
5	Mfg. Loss Unabsorbed								
6	Add: Excess Material								
7	Cost Variance								
	G-Guns:								
8	Excess Direct Labor								
9	Spoilage (Scrap)								
10	Mfg. Loss								
11	Deduct: Mfg. Allowance								
12	Mfg. Loss Unabsorbed								
13	Add: Excess Material								
14	Cost Variance								
	H-Cutlery:								
15	Excess Direct Labor								
16	Spoilage (Scrap)								
17	Mfg. Loss								
18	Deduct: Mfg. Allowance								
19	Mfg. Loss Unabsorbed								
20	Add: Excess Material								
21	Cost Variance								
	K-Cartridge:								
22	Excess Direct Labor								
23	Spoilage (Scrap)								
24	Mfg. Loss								
25	Deduct: Mfg. Allowance								
26	Mfg. Loss Unabsorbed								
27	Add: Excess Material								
28	Cost Variance								
	L-Electrical:								
29	Excess Direct Labor								
30	Spoilage (Scrap)								
31	Mfg. Loss								
32	Deduct: Mfg. Allowance								
33	Mfg. Loss Unabsorbed								
34	Add: Excess Material								
35	Cost Variance								

Jameson Mfg. Co.

FORM 3.

of die and tool-makers, of which class the Jameson Manufacturing Company was the principal employer in the city, having about 50 of them; few other manufacturers employed more than one or two, so it was a small matter to them to bid up to 10 or 12 cents an hour more than the Jameson Manufacturing Company paid. Men were sometimes tempted away from the latter by these rates, and the foreman of the department wanted to increase his rates to meet those of other companies. It was known that men preferred to work for the Jameson Manufacturing Company, on account of greater steadiness of employment the year round and better working conditions; when, therefore, this matter came before the expense manager, he suggested that an increase of 3 or 4 cents per hour to the better men would meet the situation, instead of 10 or 12 cents all around. This was done and was found to be sufficient to hold the good men; if occasionally one of the others left, no great loss was suffered. This was typical of the general effect and influence which the expense manager exerted throughout the plant. The administration of direct labor was under the factory officers, but certain standards were set for labor costs, and excess costs over the standards set were noted by the expense manager. All manufacturing overhead, including repairs and maintenance, all new construction, and all selling and administrative overhead, were subject to the direct scrutiny and supervision of the expense manager.

TREATMENT OF SELLING EXPENSES

Considerable success had been achieved with selling expenses; these amounted to nearly 6% of sales, including, as principal items, traveling, 1%, salaries, 1%, commissions, 1%, and clerical salaries, ½ of 1%. Salesmen were under the control of 14 district managers, but on the subject of expenses they reported to the expense manager. The district managers discussed routes and the best ways of covering them with their salesmen; no quotas had been set, but a salesman was expected to maintain a certain satisfactory ratio between expenses and sales, giving due weight to the number of towns he covered, their population, trade activity within the territory, and whether he was a new or an old salesman. The selling force was divided into direct salesmen and missionary men; the latter were not expected to cover their own expenses immediately, but the territory worked should show returns soon afterwards. In some cases several men worked the same territory, which made a direct comparison possible. One fact which developed from the expense scrutiny was that many of the older salesmen did not very readily take up the new lines, with the result that their sales per customer suffered and their expense ratio was poor. Among the older lines were certain classes of sporting goods, for example; the company had paid the expenses of salesmen to join clubs which used these goods, and had permitted them to devote some of their time to the sports. As these goods became a smaller part of the total sales, the wisdom of these expenditures of time and money became questionable, and under the prompting of the expense manager, and of the district sales managers, they were gradually given up. In all these activities care was taken to avoid any show of force or dictation, with respect either to expenses or to sales; a few years earlier the company had employed a high pressure sales director, who had effected large shipments from the factory to local warehouses, and even on to dealer's shelves; but there they stayed, and the subsequent clean-up was attended by considerable loss.

In the case of clerical and administrative salaries, even the replacement of a man was subject to the veto of the expense manager; the word "veto" was not used, but it was that in effect. Sometimes he would suggest a rearrangement of duties which would permit of that position being dropped; or the necessity of the work itself might be questioned.

Over a period of time the expense manager devoted about half his time to manufacturing expenses, and about half to selling and administrative. After a certain point he found the process of staff reduction more and more difficult, as he then ran into favoritism and friendships among the staff; while he was willing to consider these factors, it was difficult to know how to consider them.

When it came to proposed expenditures on plant or other fixed assets, the expense manager always wished to have a plain statement as to what would be the savings, either by expense reduction or by increased output, attributable to the new equipment.

Do you consider that the Jameson Manufacturing Company made the best possible approach to their expense problems?

What would be the alternative to the appointment of the expense manager, assuming the same necessities?

Would you recommend the appointment of an expense manager in every large manufacturing company?

What unusual features do you observe in Form 2?

6. Belmont Shoe Company

BURDEN: HOW SHOULD BURDEN BE ALLOCATED IN A FACTORY WHICH HAS A DIVERSIFIED OUTPUT?

The Belmont Shoe Company manufactured both low- and medium-priced ladies' shoes. Overhead costs were originally allocated by charging a flat rate to each pair, regardless of the quality. That this method did not distribute costs accurately was indicated by the fact that the factory cost of the low-priced shoes tended to exceed the selling price, while the factory cost of the higher-priced shoes proved to be considerably lower than the selling price.

To overcome this situation the head accountant of the company decided to allocate overhead costs on a direct labor payroll basis. As it took longer to make the higher-priced shoes, he decided that it was better to make them absorb a larger part of the overhead expense. Another advantage of this method was that it would make the odd styles bear a larger portion of the burden. The fact that the manufacture of the odd styles required more supervision and special dies made this desirable.

In carrying out his plan the accountant made the following changes. In the first place, the year was divided into two accounting periods, each of 26 weeks. Secondly, he departmentalized all the major production operations.

A short time prior to the beginning of each accounting period, an estimate was made of the probable production of that period. This estimate was arrived at by considering the capacity of the plant, the amount that the sales manager expected to dispose of, and past production records. Up to the present time these estimates had proved to be very close to actual production.

Using the production estimate as a basis, the anticipated direct labor costs and overhead were determined for each department. Direct labor was that which was used on all operations that had a specific piece rate. The departmental overhead percentage that was to be used during the coming cost period was then calculated from these estimated costs.

It was then a simple matter in finding the cost of a shoe to add the departmental overhead by using the predetermined percentage. In the assembly department, where all shoes were treated alike, the flat price per pair was still applied, but in all other departments the percentage of direct labor basis was used.

Is the selling price which a company is able to secure for its products necessarily an indication of the results which its cost system should yield?

Would the above method of allocating costs be satisfactory for a factory manufacturing shoes of only one type and quality?

7. Morehouse Machine Company

DEPARTMENTAL BURDEN: WHERE BURDEN IS DISTRIBUTED UPON A LABOR-COST BASIS, WHICH DEPARTMENTAL BURDEN RATE SHOULD APPLY WHERE AN OPERATOR IS SHIFTED FROM ONE DEPARTMENT TO ANOTHER?

The Morehouse Machine Company produced a variety of models of adding machines. Its organization comprised some 2,500 men and women, the greater proportion of whom were employed in the various producing departments. Most of the operations were of such a nature that it was necessary that all of the operators be either skilled or semi-skilled workmen. In some cases, because of the similarity of work, it was possible for one operator to do two or more operations which happened to be done in two or more different departments; this afforded the company opportunity, when one department was slack and another rushed, to shift a few of the more versatile operators from one to the other to assist in taking care of the peakload in the latter.

The shift of some of the operators from one department to another was quite frequent throughout the year and caused some difficulty in accounting for the cost of production in the departments affected. It happened many times that an operator who received a high rate of pay in his regular department was shifted to a department where the wage rate was considerably lower. As all of the burden in the factory was distributed on a labor-cost basis, the problem immediately arose as to what burden rate should be applied in these instances and upon what labor cost such rate should apply.

Obviously the rushed department which was receiving the operator's assistance temporarily did not wish to pay more than the regular market rate for the type of labor it ordinarily used, and the foreman in that department argued that if an operator was sent to his department from another, his department should absorb only the regular wage cost that was usually paid in his department, and if the operator he had received from another department was paid more in that other department the latter should be charged with the difference between the high rate and the low rate. The foreman in the rushed department reasoned that the slack department would have had idle time on its hands for the whole amount of the unused operators' time if his department had not been able to assist by using the idle employees. On the other hand, the foremen in the slack departments, already having higher costs because of the slack production period, did not wish to have their costs increased any more than was absolutely necessary, and therefore argued that if any of their operators left their department to go to another, the latter department was to suffer the full cost of the operators' time.

In addition, the problem arose as to what would happen to the burden cost in such cases. If the rushed department had to absorb not only the high wage cost of the idle operators received from the slack department, but also the burden rate applied on that wage cost as used in the slack department, it was being penalized on two accounts: first, for the wage cost which was in excess of what it would have had to pay to obtain the kind of employees needed if it had gone into the open market to hire men, and second, for the slack department's burden rate, which in most cases was usually higher than the rate used in the busy department. What the rushed department foreman desired to do was to have charged to his department the time of the workmen he received from the other department at the wage rate paid in his own department, and apply his own departmental rate for burden against the same. This meant that the slack department would have to absorb the difference in wage caused by the varying rates as an idle time factor for the employees who were not at the time engaged at all in that department, and in addition absorb the percentage of burden on that labor cost which was not taken up in the rushed department. Obviously the foremen in the slack departments always objected to this procedure.

The accounting department had never been able to settle the questions in such a manner that all the departmental foremen were satisfied, because whenever such circumstances arose as described above, the facts were clearly indicated in the reports that the accounting department sent to the foremen at the first of each month, and immediately the foremen began to complain. There were some in the accounting department who felt that after all the company was producing certain machines and that those machines had to suffer the cost incurred in their production, and that which department incurred certain portions of the cost made little difference, adding that if such a philosophy could be impressed upon the foremen there would not be any controversies. On the other hand, it was pointed out that this could hardly work for any period of time, because if for one reason or another, the cost in any one department did increase, the foreman immediately was called to the general office and asked to state the reasons. So long as this procedure was followed the departmental reports made up for the foremen would have to indicate as clearly as possible the exact costs of each department.

What method of accounting for labor cost and burden should be used in those instances where employees were shifted from one department to another?

To what extent would you say the philosophy of considering the plant as a complete unit for the production of machines could be carried in a company's accounting policy?

E. PROBLEMS OF UNUSED CAPACITY

1. Simpson Soft Drinks Corporation

BURDEN VARIATION: IN WHAT MANNER SHOULD THE UNDER- AND OVER-ABSORBED BURDEN OCCURRING IN THE DIFFERENT PERIODS BE HANDLED WHERE A BUSINESS HAS A WIDE SEASONAL OR CYCLICAL FLUCTUATION?

The management of the Simpson Soft Drinks Corporation was dissatisfied with the manner in which the general burden of the concern was distributed, for the extreme seasonal encountered in the business caused a large variation in the burden rate when each period carried its own expenses. The situation which confronted the executives was common to the industry as a whole and was due to the fact that the selling season was largely confined to the three summer months, June, July, and August, while the products could only be manufactured for a limited period before being used, because of deterioration of the carbonated beverages.[1]

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[1] The Amherst Manufacturing Corporation, in common with other companies in the machine-tool industry, faced a similar problem, except that their large variations in production corresponded, in general, to changes in the business cycle. In the distribution of overhead, this company used a normal labor-hour rate, the under- or over-absorbed burden being carried to Profit and Loss. It also developed, for statistical purposes, burden rates based on the actual hours worked in the plant which showed the variations due to changes in production. For the period January, 1928, to August, 1929, these rates were as follows:

1928		1929	
January	$1.55	January	$1.17
February	1.41	February	1.12
March	1.25	March	1.16
April	1.21	April	1.11
May	1.17	May	1.03
June	1.07	June	1.00
July	1.18	July	.97
August	1.20*	August	.93
September	1.10		
October	1.04		
November	1.09		
December	1.12		

* Considered normal.

The management felt that there should be a better way of handling the burden distribution and was considering the method used by the Sussex Metal Products Company. This firm charged all jobs processed with burden at a standard rate and

The following table (Table I) showing the production of the Simpson Soft Drinks Corporation for the year 1928 illustrates the seasonable nature of its operations.

TABLE I

PRODUCTION, 1928—CASES[1]

Months	Quarts	Pints	Splits	Days Operated	Possible Operation	Days Idle Time
January	12,000	8,000	6,000	10	25	15
February	16,000	100	10,000	13	23	10
March	32,000	20,000	16,000	27	27	0
April	20,000	22,000	16,000	25	25	0
May	18,000	12,000	16,000	25	25	0
June	36,000	12,000	32,000	25	25	0
July	48,000	14,000	32,000	25	25	0
August	50,000	10,000	26,000	25	25	0
September	28,000	6,000	12,000	16	24	8
October	30,000	4,000	10,000	14	25	11
November	16,000	8,000	8,000	12	24	12
December	12,000	20,000	10,000	16	25	9
Totals	318,000	136,000	194,000	233	298	65

It will be noted that production increased in March to take care of the summer trade, starting in June, but that the peak output was attained only in the three months of heavy sales. This characteristic condition caused a large waste due to idle time of men and equipment, for it was found necessary to maintain a regular working force in order to handle such business as was obtained during the slack season and also so that they would have trained men available for the busy periods since, in the case of the men who operated the bottling machines, a technique was required which could not quickly be developed, and the men would be difficult to replace if they were allowed to go. The force was employed around the plant in the dull seasons on special work which needed to be done, but there did

any balance remaining at the close of a period was carried to an account called "Burden Reserve." In this account, it was expected that during periods of high production, a credit balance would be accumulated which would be offset by charges during a depression, and over the business cycle it was thought that the account would normally balance out.

[1] A case was made up of 12 quart bottles, 24 pint bottles, or 24 split bottles.

not begin to be a sufficient demand for such activities to keep the workers busy. It was, therefore, apparent that the 65 days of idle time throughout the year would have to be accepted as a regular business expense and treated accordingly.

The burden of the company was roughly divided into three groups. First, the fixed charges, such as depreciation, taxes and insurance, which were not affected by the rate of production; second, expenses, which varied to some extent with production, such as light, power, supplies, spoilage and breakage; and third, the idle time of the working force. Consideration of these groups showed that the requirements of the peak production in the summer were responsible for much of the burden expense carried during the winter periods. The additional burden thus incurred, when distributed to the product manufactured during the slack season, made the unit cost for those periods almost twice that shown for the summer months, which did not seem to be sound accounting practice and, therefore, it did not satisfy the executives, who felt that the problem could be handled in a manner which would reveal more information regarding the economic aspects of burden absorption.

In what manner should their burden problem be handled? [1]

2. Covel Paper Company

BURDEN DISTRIBUTION: HOW SHOULD A MACHINE RATE BE COMPUTED?

The Covel Paper Company made a special kind of paper, involving the use of large units of plant, the operating costs of which were very heavy. The company therefore attached great importance to the calculations of the machine rates by which burden expense was allocated to the product. Moreover, the question of the correct interpretation to be placed upon over-absorbed and under-absorbed balances in the Burden Expense accounts had occasioned much dispute. It was therefore desired that the records dealing with this subject be compiled in the most accurate and reliable manner possible. The case of one machine was taken in order to bring out the questions involved.

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[1] See Dohr, *Cost Accounting Theory and Practice*, pp. 396–413.

Machine No. 8, by running day and night, had a full-time capacity of 600 hours per month, and a normal operating capacity of 580 hours per month; in April, 1922, it actually ran 520 hours. The tables following show:

(*a*) The items of expense entering into the maintenance and operation of machine No. 8.

(*b*) The average monthly amounts for each of these items, based on study of a considerable period.

(*c*) The actual amount for each item, for the month of April, 1922.

ITEMS WHICH ARE DEEMED TO VARY WITH PRODUCTION

(*a*)	(*b*) Average	(*c*) April, 1922
Indirect Labor	$ 450	$ 400
Machines and Miscellaneous Supplies	780	700
Water	135	120
Teaming and Yard Expense	560	500
Stock Handling	165	150
Repairs to Machinery, Labor	400	350
Repairs to Machinery, Material	280	250
Power and Light	4,000	3,618
Heat	370	330
	$7,140	$6,418

FIXED CHARGES

(*a*)	(*b*) Average	(*c*) April, 1922
Watchman	$ 68	$ 68
Fire Brigade	84	84
Taxes	630	630
Insurance	415	415
Depreciation	2,750	2,750
Building Repairs—Labor	395	395
Building Repairs—Materials	482	482
Supervision	200	200
Power and Light	518	518
Heat	237	237
Oiling and Cleaning	63	63
Stores—Raw Material	137	137
Stores—General	187	187
Accounting and Office	34	34
Plant Office	50	50
Laboratory	50	50
	$ 6,300	$ 6,300
Total Expense	$13,440	$12,718

Work out a machine rate which you consider to be appropriate for the distribution of burden to the products during the month of April.

Show the Burden account in the Cost Ledger, for machine No. 8, for the month.

Analyze the balance of the Burden account at the end of the months, to show what causes have produced it.

Describe the source from which each item in the list of expenses for machine No. 8 was derived.

Why do power, light, and heat appear in the lists of both fixed and variable expenses?

What is the significance of the inclusion of charges for stores, stock handling and teaming in the list of burden expenses? By what other methods might they be disposed of?

How reliable do you consider the division of expenses into fixed and variable charges would probably be? What would be the effect of error in making this classification?

3. Boston Flour Company

IDLE TIME: HOW SHOULD IDLE TIME BE DISTRIBUTED WHERE THERE IS SOME QUESTION AS TO THE CAUSE OF THE IDLENESS?

The original factory of the Boston Flour Company had been built a short distance from the railroad because the location had publicity advantages which the management considered more than outweighed the cost of trucking the wheat to the plant and hauling the flour to the freight cars for shipment. With the increased growth of the business, however, the company erected a second plant adjacent to the railroad which eliminated the additional trucking that was necessary in the operation of the older unit. As the same processes and the same types of equipment were used in the two plants their production costs were about equal, but the additional handling necessary in connection with the older unit raised its total cost of production and shipping higher than for the new factory. The management, therefore, when full capacity operation was not required, curtailed production at the older plant, thus further increasing its unit cost of operation, as the expense of carrying the idle equipment had to be absorbed on a smaller total output.

All the accounting work for the firm was done in the central offices which were maintained in the older building. The control of production, however, which was considered as a separate administrative organization, had been built up for each factory. The executives in charge of the two units were, therefore, held responsible for the efficiency of operations, and as complete reports were made up for both plants, in addition to a combined statement for the concern, a direct comparison of the results obtained was easily made. Such a comparison was generally unfavorable to the older unit because of the production policy followed by the management, and this condition caused dissatisfaction among the executives held responsible for the operation of that factory.

The superintendent of the older plant believed that the other factory was benefited by having all the idle time assigned to his unit, and therefore that it should bear a proportion of the cost of carrying the idle equipment. The controller, on the other hand, thought that the condition was comparable to the situation between two companies where one, because of a more advantageous location, had lower production costs than the other, and in that case each had to bear its own expenses. The superintendent replied that the illustration was not valid as in that case the orders received by the two companies would be made in their own plants, regardless of cost. At the same time, in analyzing the reasons for the idle time, he showed that it was caused by acts of the management over which he had no control; for the location of the plant had been chosen for reasons of advertising which did not enter into the consideration of the site of the second unit, thus causing a disadvantage from the production standpoint. Furthermore, the new factory was built with a larger capacity than was required by the company which increased the equipment left idle in the old plant. The superintendent of the older plant, therefore, felt that it was reasonable to ask for an adjustment of the costs. The controller admitted that the superintendent's statement of the situation was correct but did not feel that the new plant should be charged with a portion of the expense due to idleness, for it was not a part of the new plant's production costs.

The treasurer suggested that the production of the older plant be charged for burden at a standard rate which would allow its costs to be shown without being penalized for the expense of carrying the idle equipment. The unabsorbed burden for the older plant could then be deducted from the combined statement made up for the two units. The controller objected to this procedure because the company's business was seasonal and, therefore, the cost of a certain amount of idle time should be included as a legitimate production expense, as should also be the cost of idleness due to over-capacity. On the other hand, he believed that there was a good basis for charging to advertising expense the additional costs of hauling incurred by the older plant, but did not think that any of the expense of idleness should be allocated to that account.

Should a portion of the expenses attributable to carrying the idle equipment in the older factory be charged to the new plant?

Should the cost of the additional haulage be charged to publicity expense?

4. Vanblue Shipbuilding Company

GOVERNMENT CONTROL: WHAT INFLUENCE DO ACTIONS OF THE GOVERNMENT HAVE UPON COSTS IN BUSINESS?

Prior to the World War the Vanblue Shipbuilding Company operated a fairly large modern plant for building ships; it constructed all kinds of vessels, from launches to large passenger and freight vessels. In addition, it secured a considerable amount of repair work upon the various types of ships.

Just before this country entered the World War, the Government desired to have a number of large battle cruisers built. The Government Shipyards not being able to handle such a large order, and time being the essence of construction, it was deemed advisable to have four of the cruisers constructed in private shipyards. It was found, however, that the latter were not well equipped to build such vessels; larger shipways and special equipment in the form of cranes, conveyors, and similar equipment was necessary. For those private concerns that were interested, the Vanblue Shipbuilding Company being one, the

Government agreed to help finance the construction of larger shipways and the acquiring of other necessary special equipment with the further agreement that on the completion of the vessels the special equipment would be appraised and the Government would assume the loss in value, regardless of whether it was more or less than it had advanced. The appraisal was to make due allowance for the condition of the shipbuilding industry and the use which could be made of the war equipment at the time of appraisal.

Shortly after this country entered the War, the Government desired to expedite the naval construction already contracted for and entered into further similar agreements concerning additional plant and equipment that might be built to enlarge the capacities of the private shipyards. By this time, however, there was less option left to the private concerns, for it was either a case of them doing as the Government stipulated as to the layout of their shipyards or else the Government would take the enterprise out of private hands and control it through a war measure. The Vanblue Shipbuilding Company, having entered into negotiations with the Government before the War began, decided to make any further changes the Government stipulated by way of enlargement of its plant, and thus continued to retain the control of its plant. The company had in this way increased its plant considerably with equipment and shipways that could only be satisfactorily used to build various types of war ships.

Early in this country's participation in the War the Government desired the private shipbuilding companies, including the Vanblue Shipbuilding Company, to construct a large number of destroyers, and arranged for additional equipment to expedite their construction. Finally, as in many other cases, the amount of additions became so great that the company could no longer finance all the new equipment considered desirable, so that the Government agreed to do all the financing provided the Vanblue Shipbuilding Company, and others in the same position, would agree to buy such equipment at the completion of the contracts at an appraisal value.

Later on, the Government desired the shipyards to build merchant vessels, and agreed to finance additional suitable equipment, with the same proviso that the shipyards would purchase the equipment on the completion of the program at a price then to be agreed upon. During this same period the Government went even further in its efforts to expedite the construction of vessels of merchant type by financing new shipyards and the vessels to be built in them.

The equipment which was furnished to the private shipyards was used indiscriminately in the construction of any vessels they had under contract, either with the Government or with private concerns, some indeed being suitable for general utility purposes and not for ship construction directly. A great deal of other work not connected with shipbuilding was therefore taken up by the Vanblue Shipbuilding Company in an endeavor to make use of its huge plant after War contracts had been discontinued.

In the case of one private shipyard, at the conclusion of the Government contracts and after cancellation of some of the vessels ordered, negotiations extending over some months resulted in appraisals being made by the Government and assented to by the company. There had been a considerable loss in value, due to the depressed condition of shipbuilding after the year 1920, and the appraised values were in all cases much below cost. The Vanblue Shipbuilding Company was paid the difference between the cost value of the equipment it had itself financed and the appraised value of it, and for such equipment as had been financed entirely by the Government, the company either paid the appraised value or credited that value against amounts due from the Government.

As a result of taking over all this property, the Vanblue Shipbuilding Company acquired an enormous quantity of equipment, about twice what it started with, at a low cost, physical condition considered. But a large part of it would not have been purchased at that or any other time, regardless of price, had it not been for its relations with the Government. The problem the company had to face with this excess production capacity, which was seldom used, was that of accounting for its maintenance and upkeep.

How would the above situation influence the cost of building ships at the Vanblue shipyards?

How do you think the original purchase and cost of the equipment acquired for war purposes should have been accounted for, and also the subsequent purchase by the company in the settlement with the Government?

Would you be of the opinion that the Vanblue Shipbuilding Company might have been better off to let the Government take over its plant during the War?

5. THE MONTMARTRE PAPER COMPANY

CHARGES ON UNUSED SPACE: HOW SHOULD CHARGES FOR UNUSED SPACE BE HANDLED?

The Montmatre Paper Company owned and operated a paper mill in a small town in western Massachusetts. It manufactured chiefly writing papers of expensive grades, performing all of the stages of production from the preparation of rags to the various types of finishing processes. The mill was modern in every respect, which probably accounted for the fact that the Montmartre Paper Company was one of the most profitable in the industry.

A short time before, the company decided to purchase a small paper mill building which was located adjacent to its own mill and which was owned by one of its competitors. This building had not been used for some time so that the Montmartre Paper Company was able to purchase it at a very low figure. The Montmartre Paper Company purchased the building partly because it had been contemplating expansion and, secondly, because it wished to rid the vicinity of any competitive holdings.

Shortly after acquiring the new mill building, the Montmartre Company decided to move all of its rag operating departments to that building. After all the machinery was moved to the new building and the rag operations begun there, the floor space in the old mill remained idle. Eventually, it was intended that this space should be used for storage, but at that time the storeroom in use was large enough to handle the stock on hand.

The question thus came up as to what disposition should be made of the charges accruing on this unused space. Taxes, insurance, depreciation, and interest would regularly accrue and from time to time other items might also be included.

The accountant said that the amount was small and not worth bothering with, which meant that these charges would get into the cost of goods manufactured through the burden charge. The assistant to the treasurer argued that these charges should go directly to Profit and Loss and not under any circumstance to the cost of goods manufactured. His reasoning was that these charges came about in a similar way to losses due to unforeseen accidents and unavoidable occurrence. The treasurer, on the other hand, contended that the cost of the unused space should be charged against the operations of the rag operating departments in the newly acquired building. He reasoned that the space in the old building was made idle by moving the rag departments to the new buildings and that until the idle space was used by some other department the rag departments should stand the cost of the unused rooms.

What would be the proper disposition of this charge for unused space?

6. Eastern Fine Cloth Company

CAPACITY PRODUCTION: SHOULD CAPACITY PRODUCTION BE USED AS A BASIS OF ESTABLISHING COSTS?

Early in 1927 a new manager was employed to take charge of the Eastern Fine Cloth Company. This change was made because heavy losses had been incurred during the preceding six years and the directors believed that a change in management was necessary if the concern was to operate again on a profitable basis such as had been maintained before 1921.

The new manager found the plant in poor physical condition and the operating organization incompetent. He therefore set about improving the property by the installation of labor-saving equipment and at the same time developing an efficient staff. By the end of the year, the reorganization was pretty well completed and the company had attained a reasonable degree of operating efficiency.

Although the improvement in conditions brought about in this manner helped the general situation, it did not solve the problem which confronted the manager. The unit cost of making goods had been reduced by the improvement in the plant and organization, but with selling prices based upon the new costs, only enough business could be obtained to operate the factory at from one-half to two-thirds its normal rate, and at such a percentage of operations it was shown that profits could not be realized.

The company was selling its products in a highly competitive market, and, although on the basis of its unit costs it could sell the high priced fabrics in competition with other mills, there was only a limited demand for such goods. On the other hand, the manager knew that his cost on low-priced fabrics, where it was possible to get a large volume of sales, was higher than for some of his competitors, so that he was at a disadvantage.

A further study of the problem indicated that, if the factory were operated at capacity production, which was about 15% above normal, the unit costs of the low-priced fabrics would be reduced enough to allow the company to meet the selling prices of the competing mills. With such costs the manager considered it probable that a sufficient volume of sales could be obtained to keep the plant going full time, and it seemed that only on this basis could the concern be operated at a profit.

The financial condition of the firm forced the manager to try to obtain a capacity volume of production. The available funds of the company, which had been obtained through the personal endorsement of the directors and chief stockholders, were becoming depleted, and it was the opinion of those in control that unless a definite improvement in the situation could be brought about the company should soon be liquidated.

In order to carry out the program, it was necessary to determine a cost for all the products made under the new conditions and at the same time the manager wished to work out a method which would indicate the efficiency of operation of each department and show the responsibility that might be charged to them individually for the profits and losses incurred while operating at capacity production.

The cost system that had been used was inadequate to meet this situation. It gave the approximate unit cost of production of each line made, but did not analyze the expenses of any of the manufacturing operations, and no attempt had been made to "tie in" the cost records with the general accounts. The manager had often been asked for information as to the progress being made by the company, but had been unable to furnish statements based on data which showed the manner in which profits had been made or losses had been incurred. He therefore decided to revise the cost procedure to meet the existing needs.

The first step was the development of the cost of the different products and it was immediately recognized that two distinct elements had to be considered, first, the material cost, and, second, the cost of labor and overhead, known as "mill cost." The unit on which the cost of a product was developed was the pound, except for the finished material where weight was changed into yards by the use of a standard conversion figure.

The material cost of a product varied directly as the market prices for the raw stock required for it. A method of calculating the element of material cost for each fabric was therefore developed and, when the market price of the materials changed, the selling price for the goods was correspondingly altered. To avoid loss on material purchases, stock was bought on the market each day to cover the orders received.

The mill cost for the different products when developed would remain constant unless conditions changed. No attempt to reflect changes in unit costs due to different rates of output was to be made as the problem was considered to be one of maintaining capacity production in order to attain the cost standards set, for only by this means could a selling price low enough to obtain the necessary volume of business be established. Any discrepancy between the standard cost, thus calculated for the actual production, and the actual cost was to be considered as loss or gain due to a percentage variation of output from capacity.

The labor item of the standard mill cost at capacity volume for each product, all operations being considered, was first determined. When the expected production had been established, the number of employees required in the productive departments was worked out in conference with the overseers and the total labor cost, both direct and indirect, was determined. This total allocated to the different products and divided by their expected output gave the unit labor cost for the different fabrics. Where piece wages were used, the computations were simplified to a certain extent.

The information thus developed was typed in budget form and given to the overseers. It was impressed upon them that the company was going to sell its goods on the basis of the costs thus established and that if they did not keep the labor costs in their departments within the limits of the budget, the company would suffer a loss, and further, that their value to the concern would largely depend upon the results which they could show. It was also stated that any curtailment in production would be followed to a considerable extent by a corresponding reduction in the number of workers employed.

As it was important to know the conditions which were developing, the manager decided to maintain a weekly check of the labor costs in the productive departments of the factory. This end was accomplished by making up a report (Table 1) which showed the actual labor cost for the period in comparison with the standard labor cost for the week's production.

These reports were discussed with the overseers each week and reasons for the variations from standard investigated. It was recognized that in some cases loss could not be avoided, as, for instance, when production was curtailed, but at times it was possible to determine other causes to which corrective measures could be applied. The general attitude of the management in considering the situation was expressed by the following questions:

1. May we expect increased production in the near future at no greater expenditure for wages?
2. May we reduce the expenditure for wages and maintain the present rate of production?

On the other hand, where a gain was indicated, the chief consideration was, whether or not it would be reasonable to reduce the standard cost which had been established.

Overhead costs in the mill were handled in a manner similar to labor costs. A budget of expenditures for the ensuing year was made under the headings shown in the following table and allocated to the different production departments. On the basis of the expenses thus allocated, standard burden rates for the different fabrics for each department were determined.

Table 1

Statement of Labor Loss or Gain

(*Week ended March* 31, 1928)

Symbol	Operation	Standard Labor Cost for Actual Production	Actual Labor Paid	Gain or Loss	
				Amount	Per Cent of Standard
A 1	Carding:				
A 1	Opening and picking....	$ 149.18	$ 129.53	$ 19.65	13.2
A 2	Carding...............	350.04	348.47	1.57	.5
A 3	Sliver lapping..........	60.08	62.51	2.43*	4.0*
A 4	Ribbon lapping.........	104.15	110.21	6.06*	5.8*
A 5	Combing...............	344.91	323.14	21.77	6.3
A 6	Drawing...............	84.30	80.27	4.03	4.8
A 7	Slubbing...............	96.50	103.62	7.12*	7.4*
A 8	First intermediate......	155.27	142.19	13.08	8.4
A 9	Second intermediate.....	393.42	409.67	16.25*	4.1*
A 10	Fine roving...........	473.26	435.62	37.64	8.0
B	Spinning:				
B 1	Ring spinning..........	2,232.19	2,456.25	224.06*	9.1*
B 2	Mule spinning..........				
B 3	Spooling...............	807.53	812.32	4.79*	.6*
B 4	Doubling..............	159.90	174.46	14.56*	9.1*
B 5	Twisting...............	1,345.23	1,420.37	75.14*	5.6*
B 6	Winding (quilling)......	267.13	285.56	18.43*	6.9*
B 7	Warping...............	186.54	196.99	10.45*	5.6*
C	Silk Preparation:				
C 1	Silk spooling...........	902.45	947.57	45.12*	5.0*
C 2	Silk winding...........	1,311.61	1,400.80	89.19*	6.8*
C 3	Silk warping...........	80.09	83.29	3.20*	4.0*
D	Slashing...............	419.91	440.07	20.16*	4.8*
E	Weaving:				
E 1	Cotton weaving........	11,121.80	11,506.24	384.44*	3.5*
E 2	Silk weaving...........	3,380.91	3,547.98	167.07*	4.9*
F	Cloth room.............	1,113.30	1,226.86	113.56*	10.2*
		$25,539.70	$26,643.99	$1,104.29*	4.3*

* Loss.

Cumulative monthly reports (Table 2) were made up comparing the amount of burden earned with the total burden for the period covered. These also showed the budget figures for the different activities in comparison with the actual expenses.

Cumulative figures were used since burden charges would not ordinarily be evenly distributed over the different months.

TABLE 2

ANALYSIS OF MILL OVERHEAD

(Prepared cumulatively at close of each month throughout the fiscal year)
(For three months' period ended March 31, 1928)

OVERHEAD EARNED AT STANDARD RATES

Symbol	Department		
A	Carding	$12,205.82	
B	Spinning	24,628.73	
C	Silk preparation	4,608.42	
D	Slashing	2,563.94	
E	Weaving	33,387.18	
F	Cloth woven	3,826.52	
	Total earned	$81,220.61	
	Actual expenditure	84,956.76	
	Gain Loss	$ 3,736.15	(4.6% of standard)

ACTUAL EXPENDITURE COMPARED WITH BUDGET

	Actual	Budget	Increase Decrease
Mill Administration:			
Superintendence	$ 7,945.00	$ 7,945.00	
Designing	2,200.29	2,307.25	106.96*
Laboratory	676.81	692.25	15.44*
Mill Office	3,519.26	3,403.00	116.26
Power, Light, and Heat:			
Labor and supplies	3,603.10	3,747.50	144.40*
Fuel	9,001.82	9,230.75	228.93*
Electric current purchased	942.60	923.50	19.10
Water	258.29	230.50	27.79
Mechanical Department:			
Repair labor	5,161.36	5,355.00	193.64*
Repair material	2,421.92	2,301.75	120.17
Purchased repairs	2,598.72	2,390.75	207.97
General labor and materials	2,612.39	2,561.00	51.39
Mill supplies	11,479.28	10,758.00	721.28
Local taxes	5,768.25	5,768.25	
Insurance	1,615.00	1,615.00	
Depreciation	23,030.00	23,030.00	
Miscellaneous	2,122.67	2,307.00	184.33*
Total	$84,956.76	$84,566.50	390.26

* Decrease.

The reports were carefully studied, and, where expenses were out of line, the circumstances causing them were investigated. Such corrective measures as were possible were taken, but it was harder to control abstract overhead costs than the direct-labor costs of a department.

These two reports furnished the manager with a constant check on the efficiency of operations in the plant and showed him where losses or gains were being incurred by the company on the basis of the program which had been established. In addition, he required regular monthly statements showing the progress made by the company, and, in order to obtain these, inventories had to be determined at the end of each period. Complete physical inventories appeared impracticable, so that book inventories, kept by the balance-of-stores system, were used for raw material, work in process, and finished goods. In the case of work in process, the inventory was determined by adding to the beginning inventory materials put into process at cost, and the actual burden expense of the period (standard burden minus or plus loss of gain on overhead), less goods finished (materials at cost and burden at the standard rate). This procedure allowed him to present to the directors and others interested regular statements showing the changes that had taken place in the condition of the company.

Was the manager justified in basing his unit cost figures on capacity production?

Should he have had other reports for control purposes?

Was his method of obtaining work-in-process inventory sound?

PART IV

VARIOUS APPLICATIONS OF COSTS

VI

MANAGEMENT OF THE PHYSICAL PLANT

1. Byfield Coal Company

EQUIPMENT EXPENDITURES: HOW SHOULD EXPENDITURES ON EQUIPMENT BE TREATED?

The Byfield Coal Company, in common with many other coal mining concerns, had been in the habit of charging to Operating Costs all those expenditures which were incurred for the acquisition of the new items of equipment, if such additions were intended only for the purpose of maintaining the previous rate of production. Thus, when the mine had been getting out 500 tons per day, and on account of geological conditions it appeared likely that this output could no longer be maintained without the addition of one or two new cutting machines, the laying of new trackage, and the opening of new pasages the costs of this development work had been charged to Current Operating Expenses.

PLANT LEDGER

Department Number __________ Classification Number ______

Item Number	Description	Acquired					Depreciation			How Disposed of			
		Date	Cost	Additions		Total Cost	Rate	Amount	Net Value	Date	Book Value	Amount Received	Loss or Gain
				Date	Cost								

Form 1.

The Federal Trade Commission during 1917, 1918, and 1919 conducted investigations as to the costs of mining coal, and the form of inquiry used by the commission prescribed that expenditures of the kind referred to should be charged to Capital account, and not to Current Operating Expenses. The Commission contended that this was in accord with general accounting practice, which charges additions to equipment to Capital account if those additions would be of service during more than one fiscal year. Hearings upon this difference of opinion were held before the Committee on Manufactures of the United States Senate,[1] at which the Commission brought evidence to show that the practice that they recommended was in accord with good accounting practice, and also that there was no uniformity of practice among the coal operators prior to the issue of their form. The Byfield Coal Company, on the contrary, contended that the Commission's method was a distinct change from their own current practice, and that it would necessitate keeping their books in a different manner from that to which they had been accustomed.

How should expenditures for development be handled in the accounts of the Byfield Coal Company under the conditions described?

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[1] *Publication S-4828,* Government Printing Office, 1921.

[2] The issue here presented came to trial in the Supreme Court of the District of Columbia in *Maynard Coal Company* v. *Federal Trade Commission.* The Court issued an injunction restraining the Commission from collecting information on the forms referred to, on the ground that they constituted too much interference with the internal management of the company's business. The above example of the Byfield Coal Company is intended to be argued from an accounting point of view, upon a basis of business policy, irrespective of any question of the legal authority of the Federal Trade Commission to require information from the coal companies on any particular basis.

The following quotation from the *Report and Suggestions of Committee on Standard Systems of Accounting, of the National Coal Association,* page 9, illustrates their views on the subject:

"After a coal mine has been developed and equipped to its planned output capacity, charges to its Capital account should cease, and thereafter there will be few if any permissible charges to that account.

"Usually after one-third or one-half the life of the mine has elapsed, and from time to time thereafter, additions to power plant and major items of equipment will be necessary, and the cost thereof should be set up in appropriate Additions and Betterment accounts; and for these will have to be established an additional and separate depreciation rate based on the remaining coal or life of the mine.

"At the end of each month, Operating account should be charged, and Depreciation credited with an amount equivalent to the depreciation rate multiplied by the number of tons mined during the month. At the end of the year Depreciation should be charged with the year's accumulation, and the respective elements of the mine written off in proper proportions. If, however, the operator prefers to allow total Depreciation to stand as a credit on the ledger, it should, in the

2. Stone Valley Steel Corporation

DEPRECIATION OF STEEL PLANT: SHOULD DEPRECIATION CHARGES VARY WITH OUTPUT?

The Stone Valley Steel Corporation had recently placed six of its accounting force into a special subdivision of the auditing department to make an accurate list of all physical property owned by the company and its present valuation. On the basis of this complete list of capital equipment the management hoped to establish a more accurate system of depreciation which would show at all times the actual condition of its property, by means of a plant ledger which had been tentatively designed as shown in Form 1. The essential plan of the buildings and more important machinery used in producing steel had not changed greatly during the last few decades. Those parts of the plant

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balance sheet, be exhibited as a deduction from the cost of property. Irrespective of which way it is handled on the General Ledger, the proper reducing entries should be made against each element of the property in the Plant Ledger.

"The drawing of distinctions between capital and operating expenditures, in the accounting involved in permanent enterprises, is a favorite field for discussion among accountants, but in the case of coal mining or other wasting enterprises, experience teaches that the field for discussion, if indeed there be any, is extremely limited.

"After a coal mine has been developed and equipped to its contemplated or possible capacity, it is a constant consumer of material and supplies and equipment, which, though nominally of a durable nature, are subject to destructive wear and tear, by reason of the uses to which they are put, and all these appliances must be kept in repair to do their work or the output cannot be maintained.

"Mules and pit cars are constantly worn out, and have to be replaced, and as the working faces advance with the exhaustion of the coal, the length of haul, and consequent time of circulation of pit cars between the working face and dump increases, more motors, mules, and pit cars have to be supplied to maintain the output, and the more motors, mules, and pit cars in the mine, the greater expense for replacements and repairs.

"Also, with the advance of workings, more rails have to be laid and more copper wire or other conductors put up to carry power to the working faces to maintain the output. They remain in place until the mine is exhausted, and when they are recovered have but little net scrap value. In fact, any net salvage is relatively very small.

"The fact that these expenses are continually recurrent and practically a fixed factor in the cost of production per ton from year to year, proves that they constitute an operating rather than a capitalizable expense.

"This being so, it makes no difference to taxable income whether they are charged immediately to Operating Expense, or written off by deductions representing depreciation allowance which would have to be readjusted and compounded from year to year. As a practical matter, it is better to dispose of such expense by direct charge to Operating Expense rather than taken care of by vexatious refinements of accounting, that would be necessary if these items be capitalized and 'depreciated.'"

which were built 50 years ago had been equipped with modern machinery and could be operated about as efficiently as those parts built within the last few years. Changes of machinery had occurred so often that the problem of accounting was rather one of obsolescence than actual depreciation. Where machinery had not been superseded by improved models, its life in most instances was long, and its efficiency could be sustained by adequate maintenance.

At that time the company was figuring its depreciation on the basis of total ingot production. It had been a question with accountants in the past as to what allowance should be made for depreciation of plant and equipment when the mills were run at full time throughout the whole year as compared with when the mills were operated on a reduced schedule. In other words, what allowance should be made for a change in rates of depreciation because of a change in the amount of time the plant was operated? By fixing a flat rate to be charged for depreciation for each ton of ingots produced, the company had obtained a figure which took into account this factor of variable production. The amount to be charged per ton had been determined on the basis of past years' experience in actual lessening of capital values.

Plant Ledger

Department Number________ Classification Number________

Item No.	Description	Acquired					Depreciation			How Disposed of			
		Date	Cost	Additions		Total Cost	Rate	Amount	Net Value	Date	Book Value	Amount Received	Loss or Gain
				Date	Cost								

Form 1.

When the molten steel came from the furnaces, it was poured into large molds where it was left to cool and harden. The resulting blocks of steel were the ingots from which all further steel products were made. This method of using the production of ingots as a basis for depreciation charges apparently did not take into account the production of pig iron. Although the company sold some of the pig iron which it manufactured to foundries and other customers, it did not operate its blast furnaces to produce this pig iron except when it needed iron for the manufacture of steel in its own furnaces. Since the quantity of ingots produced, therefore, reflected the amount of iron made in the blast furnaces, it appeared that the ingot was a unit on which the entire production of the company rested and was as satisfactory as any available single unit in determining depreciation.

The following quotation from the *Official Publications of the National Association of Cost Accountants*[1] dealt with this matter.

> EFFECT OF HIGH PRODUCTION ON EQUIPMENT AND DEPRECIATION
>
> Production is one of the most important causes of depreciation. Machinery is purchased for the specific purpose of turning out production or aiding indirectly in doing so. In a great many cases engineers can roughly estimate the approximate number of units of production which a machine will manufacture before it is ready for the scrap heap. It is logical to assume, therefore, that hastening the processes of production will accelerate the rate of depreciation.
>
> Normally, as far as production is concerned, depreciation is caused by actual contact of the product with the machinery, and, with respect to auxiliary equipment, by the number of motions or movements necessary to keep in operation the equipment engaged directly in production. In cases of high production we have more production units coming in contact with what we might call "Primary Equipment" and a noticeable increase in the number of movements of auxiliary equipment to keep pace with increased production. It is true, therefore, that the demands of high production will affect not only the equipment with which the steel in the various manufacturing processes comes in direct contact, but also auxiliary departments or equipment such as steam or electric generating departments, gas producers, coal pulverizing equipment, and so forth. This is patent. If high tonnage of steel is handled in the furnace, there will be extraordinary usage of cranes, charging cars, gas producers, steam generating equipment, and so forth, to keep pace with the increased demands of the production department.

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[1] Volume IV, No. 13, p. 4.

An excellent illustration of direct depreciation is found in the blooming mill, where every ton of steel made in the open hearth furnaces in the form of ingots is reduced, by a rolling process, to "blooms." Glancing into a blooming mill one is struck by the maze of machinery. Every ton of steel that passes through the rolls jars the entire rolling mechanism, and contributes its quota of vibration which in time undermines even the foundations. It logically follows that an increase in the tonnage of steel passing through the blooming mill, will correspondingly increase the rate of depreciation in this department.

Taking into consideration the length of life of steel equipment, if there were no improvements to make it obsolete, and the great importance of obsolescence if such improvements were made, which was the more satisfactory system: first, that whereby the company charged a fixed rate for depreciation per ton of ingots produced, or, second, the charge made on the basis of a complete list of equipment, depreciated at what was considered by the company's engineers to be a fair rate for each piece of equipment?

3. Wyantenuck Coal Company

DEPLETION: WHAT FACTORS MUST BE CONSIDERED IN DETERMINING THE CHARGES FOR DEPLETION ON COAL FIELDS?

The Wyantenuck Coal Company operated two mines in the bituminous coal district of West Virginia. These mines were located in two separate fields in the same district. The company owned 500 acres and rented 1,000 acres from a holding company for which it paid a charge of 10 cents for each ton of coal taken from the mine, with a minimum charge of $25,000 a year. Normal daily production from this rented land was 1,500 tons a day, or about 450,000 tons annually. In the preceding ten years there had been two years when the company had not mined sufficient coal from this field to pay for the minimum royalty on the basis of 10 cents a ton. The land owned by the company had been bought two years previously at a cost of $200 an acre. Normal production for this mine was 1,000 tons daily, or about 300,000 tons a year. The company's engineers estimated the probable length of life of this mine at 25 years at the above mentioned rate of production.

In determining the cost of the coal mined from these two fields, the company charged the rental figure of 10 cents a ton on all coal taken from the leased land in spite of the fact that in the two years mentioned above, the actual charge had been more than 10 cents a ton because of the failure to remove 250,000 tons during the year or the amount necessary to make up the minimum royalty. In determining costs in the mine operated on the land owned by the Wyantenuck Company, no charge had been made for depletion. The omission of this charge had been made for two reasons: first, the company had been in the habit of purchasing new coal lands from the net profits so that depletion of the old fields was compensated for by the addition of new acreage; the price of coal because of the possibilities for overproduction throughout the country was determined solely by competition in the various districts. Consequently the company had not deemed it advisable to add to the difficulties of their accounting by figuring a charge per ton for depletion.

It was suggested that a charge for depletion should be made on the coal taken from the land owned by the company in order to provide comparable costs between the two mines as a gauge for efficiency of production. One of the difficulties in estimating a proper depletion charge was that although the engineers might have made an estimate as to the total amount of coal under ground, it was impossible to determine accurately just what difficulties might be encountered in mining. There was always the danger of running into rock structure that would make it impossible to get out a large proportion of the coal. There was also a possibility that in opening up the lower levels, they might be flooded and further mining rendered impossible. In addition, the risk of cave-ins which would make necessary the sinking of a new shaft was always present.

Two methods of figuring this depletion were suggested to the Wyantenuck Company. The first was to charge the same rate of 10 cents a ton that was paid for rent on the leased lands. This would make costs in the two mines comparable but had the disadvantage of being a larger charge than was considered necessary by the engineers of the company even when all the various risks were taken into consideration. The second method was to charge a rate of 7 cents a ton which was that recommended by the engineers as being sufficient to cover the actual value of the coal in the ground and in addition covered what they considered to be a sufficient amount of insurance against the difficulties mentioned above.

Should the Wyantenuck Coal Company have made a charge for depletion on coal taken from its own land? If so, which rate should have been used?

4. SANDY RIVER TIMBER COMPANY

DEPLETION COMPUTATION: ON WHAT BASIS SHOULD DEPLETION ON TIMBER LANDS BE COMPUTED?

In order to make its tax returns the Sandy River Timber Company had to figure its income on 20,000 acres of timber property which was bought in 1914 for $210,000. The value of the land itself was 50 cents per acre. Since unit depletion value was the amount of money per unit of timber deductible from capital as an allowance covering the decrease in capital value through cutting, the capital recoverable through depletion was $200,000. An estimate in 1914 showed 100,000 cords of merchantable timber, of which 75,000 cords were pulpwood, and 25,000 cords pine and spruce sawlogs. At the time of purchase the hardwoods on the property were deemed valueless. No improvements or expenditures were made on the property except about $71,000 for taxes, and $28,500 for carrying charges.

No cutting was done on the land until 1922, when the right to the following amounts of timber was sold to an operating company.

50,000 cords of hardwoods	@ $2.25 a cord
75,000 cords of pulpwood	@ $5.00 a cord
75,000 cords of sawlogs	@ $4.00 a cord

A cruise preceding the cutting of the wood showed the following quantity of merchantable timber:

125,000 cords of pulpwood
35,000 cords of sawlogs
100,000 cords of hardwood

What was the income of the Sandy River Timber Company from its 20,000-acre tract in 1922?

5. Hale Manufacturing Company

DEPRECIATION: WHAT ADVANTAGE MAY BE GAINED BY HAVING UNIFORM DEPRECIATION RATES USED WITHIN AN INDUSTRY?

The Hale Manufacturing Company's production facilities were becoming too small to meet the needs of the business when its original plant, in the latter part of 1924, was badly damaged by fire. The management decided to tear down the structure and put up a modern building on the same site. The machinery and equipment that were worth salvaging were thoroughly overhauled and put in first-class condition. A quantity of new equipment was also purchased which embodied the latest developments in machine design in the industry, so that the new factory was up to date in every respect.

In order to increase the accuracy of its cost accounting work and to determine a reasonable basis for its depreciation policy, the company decided, at this time, to make a thorough study of the depreciation problem. As the first step in the study, the basis on which the rates were to be set was outlined, namely, that regular depreciation charges were to take care of ordinary obsolescence and wear and tear on the equipment due to manufacturing use. Straight-line depreciation was to be used, as the treasurer believed, on the basis of his experience, that it gave as accurate results as the other methods advocated. Since the determination of depreciation rates must in the end be based upon estimates, the management decided to get a number of independent solutions to the problem. With this point of view the major executives of the company made up, on the basis of their experience, separate rate schedules and lists of equipment that they would include under each rate. To supplement this procedure a consulting firm was engaged to make up similar schedules, so that in all seven different estimates were obtained. An average of those results was taken which was then adjusted by the executives, on the basis of their experience, to give the final rates which were to be used by the company.

As an aid in handling the depreciation accounts, instructions were developed which covered special conditions that might arise. In the case of a piece of equipment becoming obsolete before being fully depreciated, the amount at which it was still carried on the books was to be written off in the period in which the occurrence took place. It was not to be considered, however, as an expense of the period but was taken to be an account known as "Miscellaneous Income and Expense," which was carried direct to the Profit and Loss Statement. When a piece of equipment became fully depreciated and was still in serviceable condition, it was to be carried on the books at its depreciated value and no further depreciation charged.

If equipment was put in storage for future use, no depreciation was to be charged during that period. The treasurer believed that if the machines were worth saving they would be as valuable to the company when they were put into service again as when they were set aside. Such equipment was to be carried in a separate account and have a separate reserve for depreciation shown for it. If any of the machines became obsolete while in storage they were to be written off when this fact had been ascertained.

The national trade association of the particular industry had also made up a schedule of depreciation rates for the industry. This work had been done at the suggestion of the Treasury Department in Washington, which tentatively agreed to accept, for income tax purposes, the depreciation statements of those companies whose rates varied less than 20% from the standard recommended. Companies whose rates varied more than this amount would be asked to explain the discrepancy.

A comparison of this schedule with that made up by the Hale Manufacturing Company showed that the rates developed by the firm were so much lower that the difference seemed abnormal for a concern in the same industry. Since the management of the company believed that they had developed as accurate a depreciation schedule as it was possible to get for their concern, they believed that the other rates were in error. They felt that the manufacturers in the industry were trying to play safe by fixing rates that would take care of any conditions which might arise, rather than developing a reasonable schedule that would reflect actual conditions. The question of correct depreciation rates was an important one in the industry. Conditions in the trade were becoming unsatisfactory, as all companies were trying to get whatever business was available and depreciation as an item of expense was large enough to govern whether a profit or a loss could be made on certain kinds of products.

How do you account for the low depreciation rates computed by the Hale Manufacturing Company?

Do you consider the prematurely obsolete machines properly handled?

6. Jaeger Manufacturing Company

PLANT LEDGERS: HOW SHOULD A PLANT LEDGER SYSTEM BE DEVELOPED IN A COMPANY THAT OPERATES MANY SUBSIDIARIES?

The Jaeger Manufacturing Company, which operated a number of subsidiaries scattered throughout the United States, developed an accounting plan whereby all of its plant ledgers could be kept in the controller's department at the home office as well as at the various factories. All of the plant accounts, with the exception of those for Current Construction Work, Office Furniture and Fixtures, and Automobiles and Trucks, were maintained by the controller's department in the form of a detailed plant ledger for each plant under the control of the general financial accounts. Approximately 40 active plant ledgers were kept, each containing from 2,000 to 3,000 cards, these cards or accounts being properly written up from reports which were received monthly from the subsidiary companies, and covered all plant transactions pertaining to their respective plants.

The detailed record of transactions with respect to construction work was maintained by the subsidiary companies under the control of a Construction in Process account in their own ledger, this account being supported by a subsidiary record of plant orders. All costs of new construction, purchases, and installations of new machinery and equipment were charged to the Construction in Process account, and the details recorded on the subsidiary records. When the plant orders were completed, the Construction in Process account was credited and the Home Office—Current account debited, which brought all of the fixed assets of all plants on to the books of the parent company.

The records and reports which were needed to keep properly the plant ledgers were:

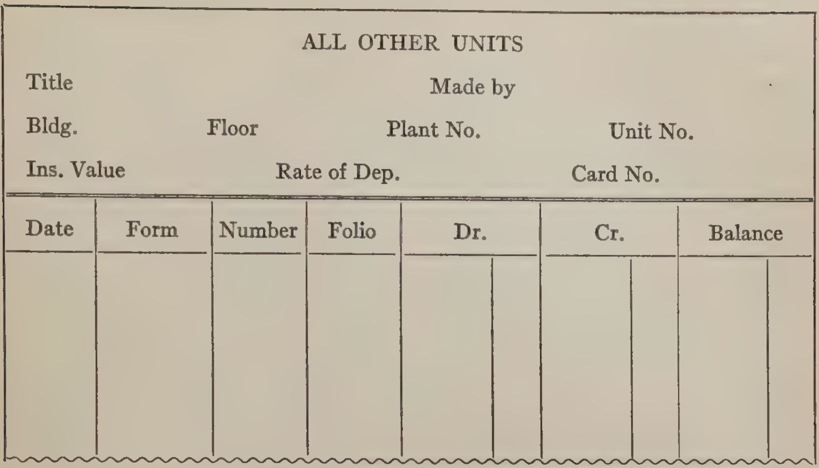
1. Plant Ledger.
2. Request for Plant Expenditures.
3. Plant Order.
4. Plant Transfer Order.
5. Plant Order Folder.
6. Plant Order Record.
7. Report of Completed Plant Orders.
8. Report of Capital Expenditures in Process.
9. Report of Property Expenses.
10. Plant Clearing Unit Credit Memo.
11. Detailed Description of Units Added to Plant.
12. Report of Changes in Unit Location Only.
13. Authorization Ledger.
14. Insurance and Depreciation Reports.

Each of these is described and discussed below.

1. PLANT LEDGER

The Plant Ledger records consisted of two 4 by 6 in. card forms; one was entitled "All Other Units," and the other "Plant Clearing Unit." The former covered all active operating plant, machinery, equipment, and parts. The Plant Clearing Unit applied to dismantled machinery, equipment, and parts which were disposed of in any of three ways, namely, equipment taken into central stores, transfers between plants, and outside sales. These two ledger cards are shown below.

A ledger card was set up for each individual unit which was classified in accordance with a "Standard Classification of Plant and Equipment," which the company had worked out. A summary card was set up for each building and each department, indicating thereon the total amounts applicable to each, while a separate card was maintained for those factories for which a specific reserve for depreciation of lasts or molds was set up. In addition, cards for control purposes were prepared to record the total plant value, separate control cards being established for each of the following classes, Land, Buildings, and Machinery and Equipment. As shown in Forms 1 and 2, spaces were pro-



ALL OTHER UNITS

Title Made by

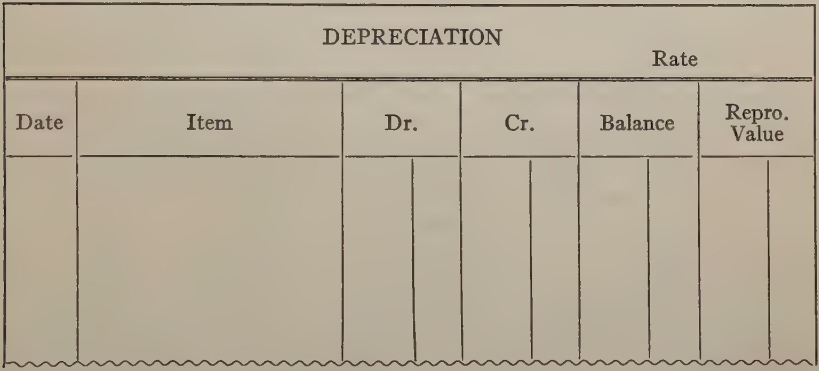
Bldg. Floor Plant No. Unit No.

Ins. Value Rate of Dep. Card No.

Date	Form	Number	Folio	Dr.	Cr.	Balance

Jaeger Mfg. Co.

Form 1.—Front.



DEPRECIATION

Rate

Date	Item	Dr.	Cr.	Balance	Repro. Value

Jaeger Mfg. Co.

Form 1.—Back.

vided on these cards to indicate the unit number, building floor, title of unit, maker's name, rate of depreciation, and insurable value.

2. REQUEST FOR PLANT EXDENDITURES

This form was used by the subsidiary companies for the purpose of requesting authority for an estimated expenditure on any project costing $500 or more, whether for additions, replacements, or renewals to property and plant or for repairs and

PLANT CLEARING UNIT

Title Card No. Plant No. Unit No.

Date	Form	Number	Folio	Charged by	Dr.	Cr.	Balance

Jaeger Mfg. Co.

Form 2.—Front.

Date	Form	Number	Folio	Charged by	Dr.	Cr.	Balance

Jaeger Mfg. Co.

Form 2.—Back.

maintenance, repairs to automobiles and trucks, demolitions, transfers, or extraordinary experimental and developmental projects, and also for work started which was estimated to cost less than $500 and was found to exceed that amount. The only exception made with respect to the use of this form was for expenditures covering lasts, which were not subject to Plant Authorization regulations, and accordingly it was not necessary to use this form for such expenditures.

These requests had to be duly approved before the project could be started, except in cases of extreme emergency, when this form was to be made out immediately upon starting the work, giving a brief explanation of the necessity for it. The same procedure was to be followed whenever an increase to an existing authorization was desired. In this event, however, the request was stamped "Increase," and the existing authorization number was shown in the spaces on the form provided for the purpose.

At the end of each month a request form was made out to cover in one total all work started on minor projects for which the estimated cost was less than $500 each for additions, replacements, or renewals to property and plant. With respect to cost of such projects a brief description of the work, plant order number, and amount to be expended was indicated on the form, with the exception of renewals which were shown in one amount. This form was not issued to cover expenditures for minor projects costing less than $500 for any complete job, if these were chargeable to Expense.

When sales or allowances were made in connection with purchases of new equipment, they were shown on this form as deductions from its cost, thereby decreasing the estimated amount of expenditure required. In cases where the cost of the new equipment was $500 or more, and the allowance was sufficient for the old equipment to bring the net expenditure down to less than $500, they were reported on the form at the end of the month together with all other minor expenditures under $500.

The Request for Plant Expenditures was made up in sets of five copies in five colors, and looked as follows:

All the data on this form with the exception of the spaces provided for "Budget No." and "Approved" were inserted by the subsidiary companies. With respect to the space provided for "Authority No." the controller's department inserted the authority numbers as it might assign them to the duly approved requests.

Full details as to the item of proposed expenditure and the necessity for it were listed on this form, showing in the space provided at the top of the form, "Item and Character of Work, Title," a brief descriptive title that would serve clearly to denote the class of work covered which was described in detail in the body of the form. In all cases of replacements, the units to be replaced were itemized in accordance with the unit numbers and reproductive values as shown in the appraisal.

Account numbers were printed on this form and space provided to insert the amount of the expenditure opposite the account to which it was chargeable. Other account numbers which

REQUEST FOR PLANT EXPENDITURE

ORIGINAL Plant ______________________
Location

Plant No. Request No. Authority No.

For Increase, Stamp Here Budget No.

Title; Description	Item and Character of Work	Estimated Cost	Recapitulation of Cost		
			Account No.	Item	Amount
			03.&04.	Repairs and Maint.	
			94.81	Extraordinary Rep.	
			94.82	Demolitions	
			94.83	Transfers, Allied	
			94.84	Exper. and Devel'm't	
			43.	Additions	
			43.	Replacements	
			43.9	Renewals	
			45.	Autos and Trucks	
				Amt. Requested	
				Previous Request	
				Total	

Requested 192
____
Factory Manager

Approved 192
____
General Manager

Approved 192
____
Second Vice-President

Approved 192
____
Vice-President

Started Finished

Posted

NOTE: In case of replacements give description of units affected, unit number, and reprod. value.

Jaeger Mfg. Co.

FORM 3.

were not printed on the form were inserted in the blank spaces as they were required. Request numbers were assigned consecutively in one series to the Requests for Plant Expenditure as received at home office from the subsidiary companies.

The original, duplicate, triplicate, and quadruplicate copies were forwarded to the controller's department for registration. The last copy was retained by the subsidiary company and filed in a post binder by request number. After being registered, the controller's department forwarded these requests to the general manager for the necessary approvals. Upon approval of the expenditure, the duly approved triplicate copy was returned to the subsidiary company to serve as authority to start the work. Upon receipt of the triplicate copy, the approval and authority number, as shown thereon, were noted in the quintuplicate copy on file. In case a request for expenditures was rejected, this also was indicated on the triplicate copy, and also noted on the quintuplicate copy. At this point the quintuplicate copy of approved requests became a permanent request register (remaining filed by request number) and the triplicate copy became a permanent authority record, being filed numerically by authority number in a post binder; and served as a posting medium to the authority ledger.

3. PLANT ORDER

The Plant Order was used for the purpose of authorizing each job which was in the nature of new construction, new installations, or renewals.

Installation of equipment purchased second-hand was also accounted for on this form. Plant Orders were numbered consecutively as issued by the factory, and a copy of each was forwarded to the controller's department.

4. PLANT TRANSFER ORDER

Sometimes machinery or equipment was transferred from one building to another at the same factory or from one plant to another. In this case a Plant Transfer Order was used.

After the transaction was completed and confirmed, a copy of the order was sent to the controller's department, where it was

PLANT ORDER

Renewal ☐	Indicate whether renewal or addition by showing X in square.	Addition ☐	Order No. Date Issued
Plant	Plant No.		Unit No.
Title of Unit Affected			Bld. No.
Date Started	Date Completed		Shop Order No.

(Charge all cost applying on this order to the above number.)

Description	Est. Cost
	Labor
	Material
	Total
	Authority No.
	Request No.

Issued in connection with Plant Transfer Ord. No.

(To be stated in case of replacement of installation of equipment transferred from Department 149 to Active Plant.)

Authorizing Signature

Jaeger Mfg. Co.

FORM 4.

used as an acknowledgment of the completion of the transaction by the plant. The controller's department reported all transfer orders each month on forms entitled "Plant Transfer Orders for Posting" and forwarded them to the factories. Upon receipt of this form the factories compiled "Detailed Description of Units Added to Plant" (Form 12 to be described later) covering the Plant Transfer Orders listed, showing the date of completion in accordance with the date indicated on the forms, and immediately forwarded them to the controller's department. A copy of each was retained by the factories to insert in their appraisal record.

In cases where a Plant Transfer Order has been issued in con-

PLANT TRANSFER ORDER

Title
Maker
Plant

Plant No.

Date Issued
Folio No.
P. T. O. No.

If this order covers transfer from
P. C. U., fill in space below.
Charge to P. C. U.*

Issued on Account of Transfer to
Sale ☐ Plant No.

Issued in connection with
P. O. No.
P. T. O. No.

Annual Rate
Stop Rate

		Transferred from							Transferred to					
Plant No.	Description	Unit No.	Building	New Reproduction Cost or Net Present Value (Cr.)	✓	Reserve for Depreciation (Dr.)	✓	Memorandum New Reproduction Cost Transfer from Plant to Plant	Unit No.	Building	New Reproduction Cost or Net Present Value (Dr.)	✓	Reserve for Depreciation (Cr.)	✓

Description and Figures Approved
By
Date

Posted as of
By
Date

Confirmed
By
Plant No. Date

N. Y. or Local Authority No.

(Write "None" when such is the case)

Authorizing Signature

* Plant Clearing Unit.

Jaeger Mfg. Co.

FORM 5.

nection with a Plant Order, where both covered charges to be made to the same unit, the Plant Transfer Order was not confirmed until the Plant Order was ready to be reported as closed. The Plant Order was closed in the same month as that for which the Plant Transfer Order was reported on the form entitled "Plant Transfer Orders for Posting." Confirmations in connection with transfers to allied plants were forwarded to the controller's department immediately upon receipt of the equipment indicated on the transfer order.

5. PLANT ORDER FOLDER

This form consisted of a 9½ by 11½ inch folder used for filing and accumulating cost data and vouchers covering expenditures on Plant Orders. The face of the folder looked as follows:

DETAIL COST DATA

Date Started	Plant Order No.	Est. Cost
Date Finished	Bldg. No.	Unit. No.
	Floor	Appropriation No.

Summary of Contents

Week Ending	Division	Item	Material	Labor	Burden	Totals

Jaeger Mfg. Co.

Form 6.

A separate folder was used for each Plant Order. Provisions were made on the face of the folder to record weekly summary expenditures, classified as to material requisitions invoices, labor charges, etc.; the supporting data and vouchers were filed therein. When a job was completed, a recapitulation of all costs and a description of the work was made from the corresponding folder and its contents.

6. PLANT ORDER RECORD

The Plant Order Record form was used as a subsidiary record to the Construction in Process account, a separate form being used for each Plant Order issued. Postings were made monthly from this record, covering all expenditures as summarized on the Plant Order Folder. Provision was made on the form, for summarizing the monthly charges, and the accumulated charges to date; the Plant Order Records were maintained in balance at all times with the Construction in Process account. A copy of the Plant Order Record is given.

PLANT ORDER RECORD

Unit Affected	Request No.	Bld'g No.
Description	Plant Order No.	Floor
Date Started	Unit No.	Appropriation No.
Date Completed	Est. Cost	

	Summary of Charges						Remarks
	Month	Material	Labor	Burden	Monthly Total	Total to Date	

Jaeger Mfg. Co.

FORM 7.

7. REPORT OF COMPLETED PLANT ORDERS

This report was used by all factories for the purpose of reporting at the end of each month all Plant Orders completed during the preceding month; separate forms were issued for additions and for renewals.

No Plant Order was reported as completed until after the final total expenditure on the same had been reported on the Report of Capital Expenditures in Process (Form 10) in the previous month. Any Plant Orders that had been issued in connection with Plant Transfer Orders where both covered charges to the same unit, were not reported as completed until the month in which the Plant Transfer Orders issued in connection with the same were reported to be posted on the form entitled "Plant Transfer Orders for Posting."

The Report of Completed Plant Orders form is given.

REPORT OF COMPLETED PLANT ORDERS

Sheet No. Number of Sheets

Plant Plant No. Month of 192

Item	Plant Order No.	Unit No.	Building	Reproductive Cost	✓	Reserve for Depreciation	✓	Total Net Charge by Plant Orders

Authorizations Completed This Month.

Totals Compared with Form 10	Form 12 Detail Approved	Form 12 Figures Approved	Summary Approved and Entered	Posted to Ledger and Appraisal

Form 8. Jaeger Mfg. Co.

The form above was issued at the end of each month in duplicate, the original being sent to the controller's department not later than the fifteenth day of the subsequent month.

The duplicate was retained by the factory. All data on this form were inserted by the factories, except in the spaces provided for signature at the bottom, which were not filled in on the original copy sent to the controller's department, but they were filled in on the duplicate copy retained by the factories as required. In cases where there were no Plant Orders reported as completed, this form was submitted with the notation "Nothing to Report." Space was also provided on the bottom of the form to indicate the numbers of all authorizations that were completed during the month.

The numbers of the Plant Orders completed were listed in numerical sequence in the column on the form provided for that purpose. If a Plant Order covered charges to more than one unit, the plant order number was listed but once, and the unit numbers chargeable indicated in the column headed "Unit No." Then a Plant Order covered charges to units for which no detailed write-ups were required, the charges were shown on this form broken down as to amounts by buildings. The amounts applicable to each unit were shown in the "Reproductive Cost" column. With respect to equipment purchased second hand, the amount shown in the "Reproductive Cost" column was the amount the equipment would have cost if purchased new. The difference between this amount and the amount actually expended was shown in the column headed "Reserve for Depreciation." When all units charged by a Plant Order had been shown on the form, the total net charge was extended in the column headed "Total Net Charge by Plant Order." The total net charge represented the total reproductive cost less any amounts, if there were such, shown as reserve for depreciation. The title or a brief description of the unit was indicated under the 'Item" column. Columns were also provided to indicate the building in which the unit was installed.

All credits to Plant Orders were shown in red on the form. When listing Plant Orders covering charges to Automobiles and Trucks, or Office Furniture and Fixtures, they were shown in the same manner as all other Plant Orders, except that nothing was indicated under the columns headed "Unit No.," and "Building."

Charges on the Report of Completed Plant Orders were substantiated by the Detailed Description of Units Added to Plant

(Form 12), except those classifications for which the values were accumulated by Unit Number on Form 9 (shown below), a separate form being made out for each building.

Title Plant No.
Unit No. Bldg. No.

Date	Item	Number of Pairs of Last			Reproductive Value		
		Dr.	Cr.	Total	Dr.	Cr.	Total
	Amounts Forward						

Jaeger Mfg. Co.

Form 9.

After all Plant Orders were listed on the form, the total was shown for each of the columns headed "Reproductive Cost," "Reserve for Depreciation," and "Total Net Charge by Plant Orders." The total of the "Total Net Charge by Plant Orders" columns, plus the total shown in the "Reserve for Depreciation" column coincided with the total shown in the "Reproductive Cost" column. After showing the total of these columns a summary of the charges was made directly under them. In cases where there was not ample space to insert the summary under the totals, a separate sheet of this form (Form 8) was used, and was properly numbered. This summary consisted of the amounts shown in the "Reproductive Cost" column charged to Land, Buildings, Machinery and Equipment, Automobiles and Trucks, and Office Furniture and Fixtures, together with depreciation amounts applicable thereto as shown in the column "Reserve for Depreciation, and the Total Net Charges" thus:

Summary	Reproductive Cost	Depreciation	Net Charge
Land			
Buildings			
Machinery and Equipment			
Total Charge to Home Office—Current Account			
Office Furniture and Fixtures			
Automobiles and Trucks			
Grand Total			

8. REPORT OF CAPITAL EXPENDITURES IN PROCESS

The Report of Capital Expenditures in Process was used by all factories for the purpose of reporting all expenditures in connection with Plant orders (Form 4). The expenditures were listed by "Authority Number" in numerical sequence, regardless of plant order number.

REPORT OF CAPITAL EXPENDITURES IN PROCESS

Sheet No. Number of Sheets

Plant Plant No. Month of 192

Brief Description of Work	Job Cost		Expended for Month					✓
	Estimated	Expended to Date	Auth. No.	Plant Order No.	Class	Charged to Plant Orders	Total Charged to Authorization	

Jaeger Mfg. Co.

Form 10.

All data on this form (Form 10) were inserted by the factories in accordance with instructions supplied from home office.

A brief description of the work covered by Plant Orders was given in the "Brief Description of Work" column. In the "Job Cost—Estimated" column the estimated cost of each job, for which specific Plant Orders had been issued, was inserted. The "Job Cost—Expended to Date" column provided for the actual amount expended on each Plant order to date, the total amount of this column coinciding with the balance shown for the Construction in Process account.

Columns were provided under the heading of "Expended for Month" to report the expenditures for the month; the authority numbers against which the expenditures were applicable were listed in numerical sequence in the column headed "Authority Number." In cases where expenditures had been made prior to the receipt of the Request for Plant Expenditures (Form 3), the request number was indicated in this column prefixed by the letter "R." The "Plant Order Number" column contained the plant order number against which the expenditures were chargeable. Since the authority numbers were listed in numerical sequence, the plant order numbers could not be listed in the same manner. In the column headed "Class Number" the factory indicated the material class number against each item, using No. 1 to denote Land, No. 2 for Building, No. 3 for Machinery and Equipment items, and No. 4 for Lasts, Molds, etc. Under the heading "Charge to Plant Orders" the amount charged or credited to the respective Plant orders during the month was indicated. The "Total Charged to Authorization" column contained the total amount expended for the month with respect to each authorization on the same line with the last Plant Order reported against the authorization.

All Plant Orders issued during the month to cover adjustments, either debit or credit, of expenditures actually made prior to the current calender year, were reported separately on this report. In case an adjustment of a prior year's expenditure applied to a Plant Order which was still in process, two items were reported with respect to that Plant Order, that is, one to cover the expenditures for the current year and, on the next line, the item constituting the adjustment. Adjustments of prior period expenditures were not reported in the column headed "Total Charged to Authorization" as that column was used exclusively for current year expenditures. All credit adjustments were shown in red on this form.

All Plant Orders which might be cancelled during the month, on which expenditures had previously been reported, were listed on this form in red, in the column headed "Charged to Plant Order" under "Expended for Month," and the amounts thus reported with respect to such cancellations were an exact offset to the amounts previously reported, and the notation "Cancelled" was inserted in the "Expended to Date" column. In cases where Plant orders might be started and cancelled within the same month, regardless of whether there had been any expenditure thereon, the notation "Cancelled" was indicated in the column headed "Expended to Date" and the plant order number shown in the column provided. Since any expenditure that might be made during the month would be either transferred to another Plant Order or cleared from the Construction in Process account in the same month, no amounts were shown for such Plant orders.

The Report of Capital Expenditures in Process was made out in triplicate. The original copy was forwarded to the controller's department, where it was used as a posting medium to the authorization ledger. The duplicate and triplicate copies were retained by the factories. The duplicate copy was filed in a post binder and served as a posting medium for the factories' authorization ledger. The triplicate copy was retained by the factory for checking up capital expenditures. In cases where there were no plant expenditures in process at the end of the month, this form was made out with the words, "Nothing to Report," and forwarded to the controller's department.

9. REPORT OF PROPERTY EXPENSE

The Report of Property Expenses covered all expenditures in connection with property and plant which were chargeable to the expense accounts, as indicated under the column headed "Recap of Charges." Other account numbers which were not printed on this form were inserted in the blank spaces as might be required.

This report was made out in duplicate at the end of each month as outlined below. The original copy was forwarded to the controller's department, and the duplicate was retained at

REPORT OF PROPERTY EXPENSES

Sheet No.

Plant Number of Sheets

Plant No. Month of 192

Brief Description of Work	Expended for Month					Recap. of Charges		
	Auth. No.	Account No.	Amount by Account No.	Amount by Auth. No.		Account No.	Month	To Date
						03. & 04.41		
						03. & 04.42		
						03. & 04.43		
						03. & 04.44		
						03. & 04.45		
						94.81		
						94.82		
						94.83		
						94.84		

Jaeger Mfg. Co.

Form 11.

the factory. In cases where there were no expenditures to report, the words "Nothing to Report" were written on the form. The expenditures against specific authorizations were listed by authority number in numerical sequence giving a brief description of the work, the account numbers to which the expenditures were charged, and the total amount which was charged against these specific authorizations, in the respective columns provided for this information on the form.

Minor expense projects for which the expenditure was less than $500 for any complete job, were reported in total by the account number to which they were to be charged, the grand total of which was shown under the column headed "Amount by Authority Number." Such expenditures were charged against a standing Authority number. In the "Amount by Authority Number" column, the total amount expended for the month against account numbers with respect to each authorization was inserted on a line with the last account against the authorization.

Adjustments of expenditures for prior years were indicated on this form under the column headed "Amount by Account Number" and excluded under the column "Amount by Authority Number."

This form served as a posting medium for the authorization ledger.

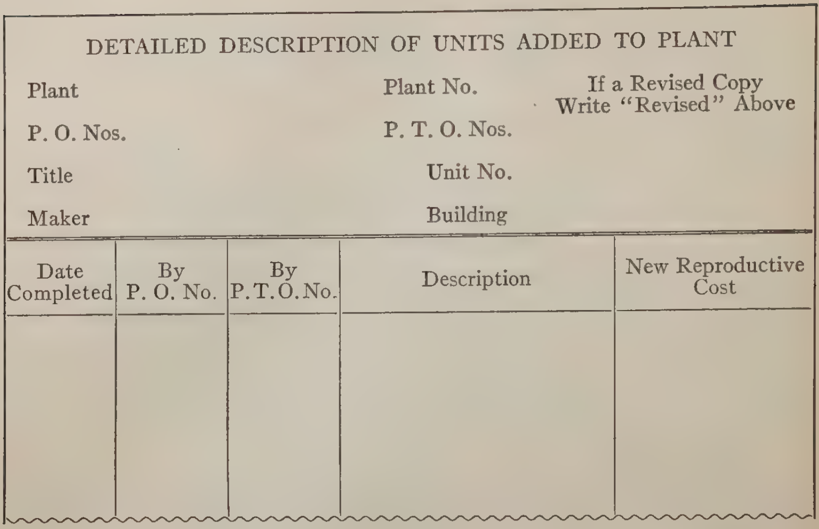
10. PLANT CLEARING UNIT CREDIT MEMO

This form was used at the end of each month for the purpose of rendering credit to the Home Office on account of sales of equipment to outside parties (except sales in connection with purchases), and on items taken into Central Stores from the Plant Clearing Unit. The form was issued in duplicate, the original copy being forwarded to the controller's department while the duplicate copy was retained by the factory.

Columns were provided on the form to record the date, the nature of the transaction, the number and type of units involved. In cases which might arise necessitating debit adjustments of prior credits, the form was used by indicating such items in red. In such instances sufficient detail was given in the "Item" column to explain the adjustment. The number of the Plant Transfer order by which the charge was made to the Plant Clearing Unit was indicated on the form. The plant's copy of the Plant Transfer order was stamped with the notation that credit or debit, as the case might be, had been sent to the controller's department. Whenever there were no items to be reported to the Home Office, this form was forwarded to the controller's department indicating thereon the words "Nothing to Report."

11. DETAILED DESCRIPTION OF UNITS ADDED TO PLANT

This form constituted a detailed descriptive record of plant units added to plant subsequent to the original appraisal, resulting from new construction or installations, or from transfers. This form also substantiated the charges made by Plant orders (Form 4) and Plant Transfer orders (Form 5). The "Reproductive Cost" indicated on this form was in agreement with "Reproductive Cost" reported on Plant Transfer Order (Form 5) and Report of Completed Plant Order (Form 8) covering the units affected. No depreciation amounts were indicated on this form.



DETAILED DESCRIPTION OF UNITS ADDED TO PLANT

Plant
Plant No.
If a Revised Copy Write "Revised" Above
P. O. Nos.
P. T. O. Nos.
Title
Unit No.
Maker
Building

Date Completed	By P. O. No.	By P.T.O.No.	Description	New Reproductive Cost

Jaeger Mfg. Co.

FORM 12.

A separate form was required for each individual unit charged by means of a Plant Order or a Plant Transfer Order. A "Detailed Description of Units Added to Plant" form might cover one or more Plant Orders or Plant Transfer Orders, or it might cover both of these forms issued in connection with each other. When this form covered charges made by one Plant Order or one Plant Transfer Order, the number was shown but once in the column provided therefor and also shown in the space on the heading of the form.

The dates of completion were the dates per the Report of Completed Plant Orders (Form 8) and the Plant Transfer Orders for Posting.

When this form covered charges made by both a Plant Order and a Plant Transfer Order, or made by more than one of each —or both, the description written up for each item was arranged in its proper place according to its relation with the other items, and regardless of whether the charges were made for the same Plant Order. Against each item the number of the order by which it was charged was indicated in the proper column on the form, with the exception, that when more than one item appeared in succession in the description and was covered by the same order, the number of the order was indicated at the beginning of the group covered by that one order, and was not repeated unless items appeared again after another order number had been interposed.

The date of completion was shown once for the respective members, that being opposite the number of the first order indicated on the form. Whenever this form covered a revision, the word "Revised" was indicated in the space provided on the top of the form. With respect to those forms which covered transactions on Plant Transfer Orders, they were prepared immediately upon receipt of the "Plant Transfer Orders for Posting" form.

The "Detailed Description of Units Added to Plant" forms were recorded and inserted in the appraisal which was written up with each individual unit on a separate page, directly after the appraisal page affected. When the page contained more than one unit, the forms were inserted consecutively by unit number beginning next to the last individual unit page in the department. Additions to standard sub-unit classifications were inserted in the appraisal after the last page of the write-up of the classification to which the addition was made, and was arranged in order by location. When a unit was cleared out by reason of a transfer, the record of it in the appraisal was not removed, but was crossed out in ink and a notation made referring to the plant transfer order number or journal voucher number by which the removal was made. Only in cases where the original record was incorrect and a revised copy was made on this form, was the original removed.

12. REPORT OF CHANGES IN UNIT LOCATIONS ONLY

The "Report of Changes in Unit Locations Only" was made out by the factories at the end of each month to report changes made within the factory during the month and thus affected building location of individual units only; this eliminated the use of Plant Transfer Orders (Form 5) which covered transfers between plants. Title of unit without description was indicated on this form.

This form was issued in duplicate at the close of each month, the original copy being sent to the controller's department and the duplicate retained by the factories. When there were no changes made during the month, this form was made out with the remark "Nothing to Report." The spaces provided at the bottom of the form "Posted by" and "Date" were not filled in on the original copy which was sent to the controller's department. All changes reported on this form were made accordingly in the appraisal.

REPORT OF CHANGES IN UNIT LOCATIONS ONLY

Sheet No.
Plant
Number of Sheets
Plant No.
Month of 192

Title or Brief Description	Unit No.	New Reproductive Cost	Reserve for Depreciation	From		To	
				Building	Floor	Building	Floor
Posted by Date							

Jaeger Mfg. Co.

FORM 13.

13. AUTHORIZATION LEDGER

Form 14 was a card used by the factories to maintain the proper control with respect to plant expenditures, thus constituting an "Authorization Ledger."

These cards provided for the recording of one year's transactions; a new set of cards was prepared at the beginning of each year. A separate card was made out for each authority, and filed in numerical sequence by authority number.

The following forms were used as posting mediums to the Authorization Ledger (as already indicated) in accordance with the instructions outlined under each:

FORM 3—REQUEST FOR PLANT EXPENDITURE

The duly approved triplicate copy of this form, when returned to the factories, constituted a posting medium to the authorization Ledger, being filed numerically by authority number in a post binder.

The necessary data was transcribed from this form to the authorization ledger cards, indicating briefly the character of the work, the plant number, year, request number and authority number in the respective spaces provided on the top of the card. Postings were then made covering the amount of the authorization, request number, and the amounts applicable to Capital and Expense, respectively, under the columns headed "Total." In cases where an increase to an existing authorization had been approved, postings were made in the same manner as above under the column headed "Amount," and the cumulative totals posted under the columns headed "Total." The request number applicable to the increase was posted in the column provided, and on the same line with the amount.

FORM 10—REPORT OF CAPITAL EXPENDITURES IN PROCESS

The duplicate copy of this form retained by the factories at the end of each month was filed in a post binder by months, and served as a posting medium to the Authorization Ledger as outlined in Section 8.

Postings were made to the respective ledger cards in this column headed "Capital Charges—(Form 10)" covering the charges for the month, and the cumulative charge to date was extended in the "To Date" column. Adjustments of expenditures for prior years were posted in the column provided for them on the card.

In cases where expenditures were made before the duly approved triplicate copy of Request for Plant Expenditure (Form

AUTHORIZATION LEDGER

Character of Work

Year

Request No.

Plant No.

Authority No.

Date	Capital Authorization		Expense Authorization		Request	Total Authorization	
	Amount	Total	Amount	Total		Amount	Total
Date	Capital Charges (Form 10)		Expense Charges (Form 11)		Adjust. Prior Years	Total Expended Current Year	Balance Unexpended Current Year
	Month	To Date	Month	To Date			

Jaeger Mfg. Co.

FORM 14.

3), a card was made out and the request number indicated in the space at the top of the card. The expenditures were posted thereon under the proper columns, and the card filed by request number. When the approved copy of Form 3 was returned, the authority number and amount of the authorization were entered on the card, and the card was then filed in proper numerical sequence by authority number.

FORM 11—REPORT OF PROPERTY EXPENSES

The duplicate copy of this form retained by the factories at the end of each month served as a posting medium to the Authority ledger, and was filed in a post binder by months.

Postings from this form were made to the Authorization ledger card under the column headed "Expense Charges (Form 11)" covering the charges for the month against the respective authorizations. After this posting was made, the cumulative amount to date was extended in the column headed "To Date." All minor expense or income projects amounting to less than $500 for any complete job were applied to a standing authority.

After the Report of Capital Expenditures in Process (Form 10) and Report of Property Expenses (Form 11) had been posted under their respective columns, the total charges indicated under the columns headed "To Date" were extended under the column headed "Total Expended Current Year."

The amount entered in the "Balance Unexpended Current Year" column, as of the end of each month, was the difference between the Total Authorization and the Total Expended Current Year.

Entries were made under the columnar heading "Adjustment Prior Years" from the Report of Capital Expenditures in Process (Form 10) and the Report of Property Expenses (Form 11) covering adjustments of expenditure for prior years. The amounts entered in this column were used for memo only and to prove postings from the two reports just mentioned. The total of this column did not in any way affect the amounts entered in the columns headed "Total Expended Current Year" and "Balance Unexpended Current Year."

INSURABLE VALUE SCHEDULE

Plant Plant No.

Compiled as of Building No.

Unit No.	Depreciation Per Cent		Present-Day Reprod. Value	Insurable Value	Unit No.	Depreciation Per Cent		Present-Day Reprod. Value	Insurable Value
	P. L. Rec.	Max. Ins.				P. L. Rec.	Max. Ins.		

Jaeger Mfg. Co.

Form 15.

FACTORY INSURANCE VALUATION REPORT

Plant Plant No.

Location Month Ending

	Item No. 1	Item No. 2	Item No. 3	Item No. 4	Item No. 5	Item No. 6	Totals
Buildings							
Machinery and Equipment							
Construction in Process							
Office Furniture and Fixtures							
Stock—Finished Goods							
" —Raw Material							
" —All Others							
Totals							
Insurance in Force							

Use space below to indicate building numbers and miscellaneous construction units covered by each item.

Signed

Title

Jaeger Mfg. Co.

Form 16.

SCHEDULE OF ANNUAL DEPRECIATION AMOUNTS

Plant N. Y. Jr. No.

Plant No. As of January 1, 19 Sheet No. of Sheets

Unit	Per Cent	Annual Depreciation Amount	Reprod. Value Figured on	✓	Unit	Per Cent	Annual Depreciation Amount	Reprod. Value Figured on	✓	Unit	Per Cent	Annual Depreciation Amount	Reprod. Value Figured on	✓

Jaeger Mfg. Co.

Form 17.

14. INSURANCE AND DEPRECIATION REPORTS

In addition to the above reports and form, the foregoing Forms 15, 16, and 17 were also used but the data in them were not posted.

Comment critically upon the above accounting plan.
What modifications and charges, if any, do you suggest?

7. Scarfon Manufacturing Company

PLANT LEDGERS: OF WHAT VALUE MAY A PLANT LEDGER BE IN ACCOUNTING FOR DEPRECIATION, MAINTENANCE AND REPAIRS?

The Scarfon Manufacturing Company had encountered some complications in its accounts for plant, depreciation, repairs and maintenance, which had raised questions both as to whether their accounting treatment of these matters was sound, and also whether the keeping of a detailed plant ledger would be helpful in affording a clear record on these items.

The book value of the plant and machinery was about $753,900, upon which a Reserve for Depreciation had been accumulated amounting to $629,400, or 83% of the book value. A good deal of the plant, especially the buildings, was quite old; no serious attempt had been made to establish a value based upon March 1, 1913, figures, but this had been estimated to be in the neighborhood of $800,000. Even upon this valuation, however, the Reserve for Depreciation was nearly 80%.

Several circumstances had contributed to bring about this situation. The plant and operations were of such nature that the expenditures for repairs and maintenance were in any case heavy. There had also been talk for some time within the company of abandoning this plant and constructing a new one in a different locality; while nothing very definite had been agreed upon yet, such a move was considered to be a part of the company's long-time program, and was certainly one of its ambitions. A natural tendency to conservatism had, therefore, been augmented by these facts, with the result that, although considerable expenditures for maintenance had been charged against the Reserve for Depreciation, it had grown to the extent indicated above.

The management now believed, however, that it was undesirable to increase the Reserve for Depreciation very much further; in addition, they were concerned to show capitalizable expenditures in a form which would justify their subsequent depreciation, both for internal and for income tax purposes. On the latter point they had ascertained that debits against the Reserve for Depreciation, although they increased the net worth of the plant, were not regarded by the internal revenue department as increasing the plant value on which depreciation might be allowed for income tax purposes. If, on the other hand, substantial expenditures for replacements and renewals were charged to capital account, the department was willing to regard these as proper increments in the plant value subject to depreciation.

It was realized that the strictly correct way of handling this matter was to credit the Plant account for the value of an asset when it was retired, and to debit the Reserve for Depreciation for a corresponding amount, thus assuming, under the circumstances, that it had been fully depreciated. When the old plant unit had thus been eliminated from the records, the new unit became, of course, a definite addition to the plant and was properly chargeable to the Plant account. But since there was in most cases no record of individual units of plant, this procedure was impossible. Rather than guess, therefore, at the amounts which should be allowed on plant items retired, it was thought best to leave them in both the Plant account and Reserve for Depreciation, to regard them as thus having a net value of zero; and to regard renewals and replacements as additions to the plant, which should be debited in the Plant account.

It was well understood that this procedure would tend to inflate equally the Plant account and Reserve for Depreciation, though leaving the net value of the plant unaffected. No very serious objections to this situation were seen, though it was to be expected that at some time a revision of these accounts would become necessary. It was, however, suggested that a Plant ledger be started by making an individual record of all new items added to the plant after that date. This record would serve to substantiate and explain the amounts added to the Plant account, both for internal and income tax purposes; and if continued, it would mean that in due time there would be a detailed plant record of most of the items in the plant. This procedure was therefore adopted, leaving in abeyance the question whether it might be useful to set up a complete plant ledger of old plant units also, based perhaps upon an appraisal of their current sound value.

Was a partial plant ledger of the nature indicated a helpful contribution to the solution of their difficulty?

What would be the content of this plant ledger? What information would it show?

What is your opinion of their decision to postpone the clearing of the Plant account and the Reserve for Depreciation of old items of plant to be replaced?

8. Higgins Construction Company

ACCOUNTING FOR EQUIPMENT: HOW SHOULD A CONTRACTING FIRM ACCOUNT FOR EQUIPMENT USED?

The Higgins Construction Company was a large firm doing general contracting in a good-sized metropolitan district. Because of its size and location, its operations were both extensive and diversified, including the construction of private dwellings, industrial plants, large city buildings, apartment houses, bridges and sometimes roads. The members of the firm accepted work under all types of contracts in order to oblige customers or to obtain work that was particularly desired, although they much preferred the cost-plus plan and were usually able to obtain it, because of their reputation for reliability.

When working under the lump sum type of contract, the firm agreed to perform a certain amount of work according to plans and specifications for a lump sum. The owner, on the other hand, agreed to a schedule of payments, generally monthly, on the basis of 85% of the cost of work done and materials delivered to date, the balance to be paid in a specified period after completion.

The cost-plus contract was drawn up, as its name indicates, to include the actual cost of construction plus a specified profit. Usually there was a maximum cost over which the owner would not be called upon to pay, and an estimated figure below which any savings would be divided between owner and contractor. The sum considered as profit might be either a set amount or a percentage of the actual cost. If the financing of the job was done by the owner, the contract was known as a "fee contract" and the contractor was given a stipulated amount for plant rental to cover the wear and tear on the equipment used in the construction work.

The unit price contract was little used by this concern, because it necessitated breaking a building job down into individual units of work for each of which a cost had to be specified. Although the contractors had to do this very thing in preparing an estimate for any job themselves, they did not like to bind themselves on the individual items of work. It also increased their costs of estimates by forcing them to make practically a separate agreement for every stage of the construction.

The jobbing work system was sometimes used. This was very similar to the unit price contract, with the exception that the contractor was hired as an employee, rather than acting as an agent. In this way, the firm received a flat fee for administering a definite part of the construction work. Such agreements were only used on small jobs or in handling one item of construction on a large one, such as excavating, plastering, or installing plumbing.

In working under any one of these plans, the concern had to know the costs of every type of work before submitting a bid, and to facilitate drawing up accurate estimates, extensive cost records had always been kept. On small jobs, the cost acounting was done in the central office, and on large construction work, individual offices for costing purposes were established on the location. Material, labor, and burden costs were collected not only for each stage of the building, such as excavating, foundation, and frame construction, but according to the trade employed. Because of the variation in working conditions caused by differences in structure of soil, location, weather, size of job and material used, the executives found great difficulty in forming an accurate estimate. This they found particularly true with respect to making the proper charge for equipment used, and they wished to find some standards by which they could estimate this item.

Equipment had always been divided roughly into three classes according to its durability. These were heavy equipment, such as boilers, donkey engines, and steam shovels, that usually outlasted several jobs; general equipment like shovels, picks, drills, and jacks that depreciated greatly, but which still had some value upon the completion of a job; and perishable equipment which included belting, brooms, files, rope, etc., which were used up usually on a single job. Inventories of all three classes of equipment were kept carefully, there being a system of Inventory Movement sheets and Shipping List records of which one was kept for each class of equipment. One column on the Inventory Movement Sheet recorded the quantities of equipment in the yard, and another set of columns showed the quantities on the various jobs while, in the last, the total equipment owned was recorded. A Shipping List Record was kept to control the shipping tickets sent with equipment moved from job to job or from yard to job. There was, therefore, a check through this Shipping List Record and Inventory Movement Sheet upon the use of all equipment.

On the job, the individual workmen were held responsible for tools and small equipment which were only issued to them in exchange for time checks. Upon the return of the tools, the workmen were given back their time checks, without which they could not obtain pay envelopes. The individual items of equipment could in this manner be charged against the exact part of the construction upon which they were used, and the final records were used as a basis for building estimates on future construction.

The executives were always bothered with the problem of allocating the proper charge for equipment to jobs, especially with respect to the heavy items. Each piece of equipment was individual in itself with its own rate of depreciation depending upon working conditions under which it was operated. The second two classes of equipment were not considered so difficult to handle, the perishable equipment being charged at cost to the job, with a small allowance sometimes for salvage value, and the general equipment being charged at cost, but a credit given for all tools returned in good condition. Records on these groups of items offered the executives a fairly sound statistical average upon which to base an estimate.

Upon the heavy equipment, a rental charge was made to the job which took into consideration the following factors: probable rate of depreciation, cost of repairs, storage, insurance and taxes, average idle time between jobs, and the salvage value. The rental charges made by firms that leased equipment to contractors were used as a check upon the engineers' estimates, but it was felt that charges made to jobs should not include any profit as these did. Besides, under the agreement in many of their contracts, only cost could be charged for this service, as profit was given in a lump sum of percentage of cost. The result was that in every case an engineering estimate actually had to be made of just what cost had been resulting from the use of the equipment.

The executives were somewhat dissatisfied with this procedure, for they felt that in establishing a cost by engineering estimates, personal judgment played too important a part, and that, consequently, there was a great chance of error. They felt also that it might be possible to work out standards with which to charge every job that, on the average, would be satisfactory; but until this time they had been unable to work out any.

Was this company's method of controlling equipment satisfactory?

Would it be possible for this company to work out standard charges for use of heavy equipment, or was their method better adapted to the individual job?

9. Effect of Depreciation on Fair Value

HOW SHOULD DEPRECIATION BE TREATED IN THE VALUATION OF PUBLIC UTILITY PROPERTIES?

No other topic connected with the valuation of assets for rate making purposes has excited more discussion or been held to be of greater importance than the question whether or not account should be taken of the fact that in normal circumstances a plant is partially worn out, and whether this fact should be regarded as an impairment of the investment upon which a utility is entitled to returns. The magnitude of the interests involved are amply illustrated by a few figures. Statistics for Wisconsin, Michigan, and Minnesota show depreciation to have accrued upon the railroads in those states to the extent of from 12 to 18% of the total valuation or from 24 to 43% of the particular assets on which depreciation was calculated.[1] In the first of the valuations to be issued by the Interstate Commerce Commission during the present Railroad Valuation, the Texas Midland Railroad[2] was shown to have a valuation of 75% of the cost of reproduction new, exclusive of lands. Applying this proportion to the total value of all steam roads adopted by the Interstate Commerce Commission for the purpose of the rate increase, namely $18,900,000,000,[3] which may be presumed to be the depreciated value, we find that over $6,000,000,000 are at stake on railway property alone, as the cost of reproduction new would be over $25,000,000,000.

THE LEGAL SITUATION

One of the first of the decisions now regarded as determinant in this matter is the *Knoxville case*,[4] in which Mr. JUSTICE MOODY said:

> The cost of reproduction is one way of ascertaining the present value of a plant like that of a water company but that test would lead to obviously incorrect results, if the cost of reproduction were not diminished by the depreciation which has come from age and use.
>
> But the reservoirs, the mains, the service pipes, structures upon real estate, standpipes, pumps, boilers, meters, tools and appliances of every kind begin to depreciate with more or less rapidity from the moment of their first use. It is not easy to fix at any given time the amount of depreciation of a plant whose component parts are of different ages with different expectations of life. But it is clear that some substantial allowance for depreciation ought to have been made in this case (p. 10).
>
> * * * * * *
>
> A water plant, with all its additions, begins to depreciate in value

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[1] *Quarterly Journal of Economics,* August, 1914, "Depreciation in Valuation Cases."

[2] Interstate Commerce Commission; *Valuation Docket No. 2, Texas Midland Railroad.*

[3] *Railway Review,* August 7, 1920, p. 188.

[4] *Knoxville* v. *Knoxville Water Company,* (212 U. S. 1.)

> from the moment of its use. Before coming to the question of profit at all the company is entitled to earn a sufficient sum annually to provide not only for current repairs but for making good the depreciation and replacing the parts of the property when they come to the end of their life. The company is not bound to see its property gradually waste, without making provision out of earnings for its replacement. It is entitled to see that from earnings the value of the property invested is kept unimpaired, so that at the end of any given term of years the original investment remains as it was at the beginning. It is not only the right of the company to make such a provision, but it is its duty to its bond and stockholders, and, in the case of a public service corporation at least, its plain duty to the public. . . . If, however, a company fails to perform this plain duty and to exact sufficient returns to keep the investment unimpaired, whether this is the result of unwarranted dividends upon over-issue of securities, or of omission to exact proper prices for the output, the fault is its own (pp. 13-14).

The other authoritative decision is that contained in the *Minnesota Rate Cases,*[1] where it was found that the Master in a lower court had deducted nothing for depreciation, because he considered it to be fully offset by appreciation. The Master had nevertheless allowed the sum of $1,600,000 for adaptation and solidification of roadbed as an extra item in the cost of reproduction, whereas the amount of depreciation was estimated by the engineer for the state commission at about nine or ten million dollars, which item had been entirely omitted from the findings. The decision, by Mr. JUSTICE HUGHES, said:

> We cannot approve this disposition of the matter of depreciation. . . . When an estimate of value is made on the basis of reproduction new, the extent of existing depreciation should be shown and deducted. . . . Instead of a broad comparison there should be specific findings showing the items which enter into the account of physical valuation on both sides. . . . And when particular physical items are estimated as worth so much new, if in fact they be depreciated, this amount should be found and allowed for. If this is not done, the physical valuation is manifestly incomplete. And it must be regarded as incomplete in this case. *Knoxville* v. *Knoxville Water Co.,* 212 U.S. 1 (p. 458).

These two decisions have been regarded as governing in all subsequent litigation of this character; courts and commissions frequently dismiss the matter of depreciation without further argument than simple reference to the above citations. Such references are sometimes accompanied by comments to the effect that the decisions of the Supreme Court have never been very specific, especially as to the measure of depreciation. But it is doubtful if the Supreme Court could wisely do more than cover the general principle; to go further, and to lay down more specific rules, would be contrary to the oft quoted dictum of the Court in the Minnesota case that "the ascertainment of that value is not controlled by artificial rules. It is not a matter of formulas, but there must be a reasonable judgment having its basis in a proper consideration of all relevant facts." [1]

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[1] *Minnesota Rate Cases* (230 U. S. 352).

In the case of the *Contra Costa Water Company* v. *City of Oakland* it was stated that although certain limitations might be set up on the applicability of the generally received doctrine of the case, yet "it may be considered to stand for the following propositions, namely, that the depreciated value of public service property is the proper rating basis for determining fair return; that the rate payers must pay for the depreciation of public service property; and that such a company is entitled to earn its depreciation annually as the depreciation accrues." [2]

In the first of the valuations put out by it, that of the Texas Midland Railroad, the Commission declares that "the bureau has treated depreciation as the exhaustion of capacity for service. It has enquired how much of such capacity existed when new, what part has been used up, and what part still remains." [3] Then later, "We approve and adopt the definition of depreciation which the bureau has applied in this case." [4]

In a Maryland case,[5] one of the counsel to the Commission put in an extended brief containing an elaborate argument in support of the deduction of depreciation from the value, but composed of somewhat different reasoning. He considers that the complexities of the problem would render it well-nigh insoluble, were it not for one dominant fact, namely, that the public has paid to the telephone company amounts in excess of current requirements, which amounts are indicated in the Depreciation Reserve account.

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[1] *Minnesota Rate Cases*, 230 U. S. 434.

[2] *Contra Costa Water Company Report*, p. 56.

[3] *Texas Midland Railroad, Valuation Docket No. 2*, p. 48.

[4] Page 51.

[5] Before the Public Service Commission of Maryland: *Notes on Depreciation, In re Chesapeake and Potomac Telephone Company of Baltimore City Rate Investigation;* by OSBORNE I. YELLOTT.

> In short, it would seem that the only real function of the depreciation Reserve Account, as such, is to serve as an index to the public's investment in the plant and property, representing, as it does, an accumulation of allowances for depreciation which the public has contributed in excess of the amounts actually required from year to year for the making of necessary replacements.[1]
>
> * * * * * *
>
> So, while the reserves are really owned by the proprietor of the enterprise, the public is entitled to control their disposition.[2]
>
> * * * * * *
>
> And inasmuch as fairness both to the public and the utility is the end to be accomplished, it would seem to follow that if the public has been required to pay rates sufficiently in excess of the actual cost of service, to create such reserves in order that the company might have them on hand in time of need, the amount of such reserve should be charged against the actual cost of the entire property in determining the fair value of the property for rate making purposes.[3]

ENGINEERING PHASES

A committee of the American Society of Civil Engineers was appointed to consider the whole subject of valuation. It was January, 1917, before the Committee was able to make a final report.[4]—too late to be of much use in determining methods for the valuation of the railroads, the event which originally prompted the investigation, though the general principles stated form an important contribution. Along with the Committee's own views, it contains a fair statement of all the other points of view upon the questions involved.

The Committee in substance believes:

1. That depreciation provided for in the accounts is a fair and proper deduction from the valuation of the property, except that:

> (*a*) If the depreciation was provided for by sinking fund, and the valuation is for rate making, no deduction should be made.

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[1] Page 33.
[2] Page 32.
[3] Page 34.
[4] *Transactions, American Society of Civil Engineers,* 1917, pp. 1311–1583.

This exception is obviously based on the assumption that the sinking fund will be excluded from the inventory of assets; in that case it would of course be necessary to value the property at its undepreciated amount, in order to do justice to the company. But the assumption is unwarranted: the fund would be included in the inventory,[1] and therefore the property would have to be depreciated, and the total assets restored by the addition of the funds.

> (*b*) If the company has been prohibited by regulating authority from including depreciation in its rate charges, and therefore has been unable to collect it from the public, no deduction should be made.

The Committee pointed out that decisions adverse to the inclusion of depreciation in operating expenses have in the past been rendered by the courts, such decisions being detailed in the report. The Contra Costa Water Company, for example, was precluded by the city of Oakland, California, from charging for depreciation in the rate, and in spite of this omission earned only 5.04% per annum for many years. In the litigation which ensued, Mr. H. M. Wright, Standing Master in Chancery, deducted depreciation amounting to over a million dollars, as he was bound by law to do. But he commented upon the fact that the company had been debarred from making this good out of income, thereby suffering injustice.[2] It would appear to be an example in support of the statement that the deduction of depreciation may operate unfairly; but it must be observed that in this case the company won; even after the deduction of depreciation, the Master declared the rates to be confiscatory, which meant that the company continued to charge its own rates. The recommendation to engineers engaged upon valuation work, that they should call the attention of the court to any special circumstances tending to show whether a utility has or has not been able to make good its depreciation,[3] is therefore entirely pertinent.

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[1] As decided in *Bonbright* v. *Corporation Commission of Arizona*, 210 Fed. 44, 52.

[2] Contra Costa Water Company, *Report of the Standing Master*, p. 84.

[3] *Transactions, American Society of Civil Engineers*, 1917, p. 1495; and *Spring Valley Water Company* v. San Francisco, p. 141.

Depreciation has been regularly provided on railroad equipment, in railroad accounts, since 1907: on road and structures the provision is optional: in practice many of the roads set up depreciation on structures, and practically none do so on the roadbed. When, therefore, the Commission states a depreciated value for all three classes of property, there is a reasonable doubt as to how far the railroad has been able to reimburse itself in respect of depreciation on equipment owned before 1907 and still in use, and on road and structures. The whole question of the adequacy of past rates to satisfy depreciation requirements and to grant a fair return is here involved, a question which would have to be answered separately for each individual road, by a computation resembling those employed by the Wisconsin Commission in estimating "going value."

To summarize the engineers' viewpoint the keynote of their position is in the physical condition of the plant, and they fail to find any close agreement between this and the ordinary accounting provision for depreciation. For the engineer, plant must be maintained at an operating efficiency practically as good as new; if this cannot be done, the plant is scrapped to make room for new; depreciation is mostly of that sudden catastrophic kind, which arises when a machine that has operated at practically one hundred per cent efficiency for nine years is thrown on the scrap heap in the tenth, and a new machine installed in its stead. It is easy to see how, following this line of argument, the engineer can convince himself, with respect to a particular plant in normal working order, that "there is no depreciation." If there were, the depreciated items would have to be replaced at once; but if the plant is working properly at that moment, all is well, for the engineer.

> It is the duty of the railroad company, says Professor G. F. Swain, to maintain this property practically as good as new, and the State has power to compel the owners of the property to do so. Portions which are worn out must be replaced out of operating expense, and for purposes of operation the property is always as good as new. If, therefore, the valuation is for the purpose of justifying rates or capitalization, 100% valuation should be taken.[1]

[1] *Valuation Report on New York, New Haven and Hartford Railroad,* p. 68. However, Professor Swain gave the amount of depreciation in case the Commission wished to use it.

In another case, Mr. G. W. Whittemore, engineer for the Chesapeake and Potomac Telephone Company, starts out by apparently accepting the definition of depreciation contained in the accounting system of the Interstate Commerce Commission; it is "deterioration." But he wishes to measure this by actual inspection of present condition, to ascertain "the actual, demonstrated, recognized effects of the past." Looking at the plant, he sees it operating in all its parts as efficiently as ever it did, and decides that there is no depreciation; his evidence was to that effect.[1]

Examples might be multiplied indefinitely. Mr. Allison urges this view with great vigor,[2] and so does practically every valuation engineer who argues against the subtraction of depreciation from the plant valuation.

But it has been shown that this is not enough. Far otherwise is the economic basis of the value of productive goods, and the processes by which those values are consumed and replaced via the income account. If the value of the capital items is based upon its product, and becomes embodied in that product, then that value is diminished commensurately as its output proceeds. This is not only sound economics and good accounting; it is the only satisfactory viewpoint for the financial management to adopt; no shrewd business man, in a private bargain, would fail to be guided by it. And it is true in a valuation for rate making.

Another notion sometimes put forward is that many assets, given proper maintenance, can be made everlasting, a process of reasoning which enables some people to contend that, while it is necessary to make a substantial annual charge to revenue for depreciation, there never is any depreciation of the existing plant. In the *Chesapeake and Potomac Telephone Cast,*[3] Mr. G. W. Whittemore, engineer for the Bell Telephone System, estimated the life of a switchboard at something less than ten years for the purpose of determining the annual depreciation charge to income; but for the purpose of ascertaining the present or depreciated value of the same switchboard, he said its life was practically perpetual. That is, the necessary replacements of parts of the switchboard amount in value to the whole cost of the switchboard in approximately ten years; but this constant renewal of parts makes the life of the switchboard indefinite, so that it is worth 100% of its new value. At any one moment, however, the service capacity of the switchboard in use has partly elapsed, so that the replacement costs are that much more imminent than in the case of an entirely new board, and the old board is depreciated in proportion.

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[1] Yellott, O. I., *Notes on Depreciation,* p. 84 et seq.

[2] *Report on the Houston Lighting and Power Company;* also, *Should Public Service Properties be Depreciated to Obtain Fair Value?*

[3] Chesapeake and Potomac Telephone Company, P. U. R. 1916 C, 946.

In finding the value of public utility properties for rate making, should any deduction be made for depreciation?

Would you recognize any exceptions to your previous answer?

VII

COST ANALYSIS FOR COMPLEX PRODUCTION

A. JOINT COSTS AND BY-PRODUCTS

1. HARRINGTON WOOL COMPANY

BY-PRODUCTS: HOW SHOULD THE COST OF BY-PRODUCTS BE DETERMINED?

The Harrington Wool Company was a firm of Boston wool merchants which bought raw wool, sorted it, had it combed by an independent mill, and then sold it. It used three principal cost records, from which its book costs were obtained and its selling prices estimated.

The first record was an Estimating sheet, similar to the following form (Form 1):

Grade	Sort Inventory	Sort Market	Cost of Conversion	Cost in Top	Offering
36's Z...........	$0.40	$0.45	$0.11	$0.56	$0.65
40's K...........	.45	.50	.11	.61	.68
44's C...........	.50	.52	.12	.64	.70
46's W...........	.55	.60	.13	.73	.80
50's L...........	.70	.73	.14	.87	.97
54's S...........	.80	.83	.16	.99	1.10
56/58's H........	.90	.93	.18	1.11	1.20
60's T...........	1.10	1.15	.25	1.40	1.45
64's R...........	1.25	1.30	.32	1.62	

FORM 1.

The grades shown in the first column were standard for the wool trade as a whole. They were followed by a series of letters, used by the Harrington Wool Company to indicate its private grade names. Column 2 contained conservative figures used for inventory purposes, which were in every case less than the company's best estimates as to what each sort of wool in the grease was bringing in the market given in column 3. Column 4 showed the estimated cost of conversion into tops, whereas in column 5 was given the estimated cost of the finished product in tops. The last column showed the approximate price at which salesmen were to make offerings. Sheets of this sort were compiled and distributed as often as there was any considerable change in the market. All costs on this sheet were for one pound of wool.

The second form used, which gave the sorting record, indicated the number of pounds received in a lot, the results of sorting, and the prices paid for each grade in 100-pound lots.

A lot of 2,884 pounds, contained in 13 bales, had been bought. An allowance for tare, in this case 3 pounds per bale, was made, reducing the wool to be accounted for to 2,845 pounds. At the time of sorting there were 456 pounds of grade S, 1,632 pounds of grade L, 415 pounds of grade W, 74 pounds of grade C, and 32 pounds of grade Z wool, besides 67 pounds of stained and grey wool, 102 pounds in wool clips, and 12 pounds of string. The total weight, therefore, was 2,790 pounds; there was an unaccountable shrinkage in sorting of 55 pounds, which might

SORTING RECORD

Grade	1	2	3	4	5
	Pounds	Per Cent	Prices in Grease	Prices Clean Wool	
S..............	456	17.5	$0.36	$0.78	$ 6.30
L..............	1,632	62.6	0.46	1.00	29.07
W..............	415	15.9	0.255	0.55	4.05
C..............	74	02.8	0.215	0.47	0.60
Z..............	32	01.2	0.16	0.35	6.19
	2,609	100.0			$40.21
Stained and Grey..	67				
				Average on hand...	$36.25
Clips............	102				
Strings..........	12			Shrinkage factor....... .08	$39.15
				Sorting..........	1.06
	2,790				
Loss............	55				$40.21
	2,845				

Form 2.

have been a loss in moisture content. In the second column were shown the percentages of wool sortings in each class; no attention was paid in this calculation to any waste which, although it did have a small value on the market, was treated as worthless. From the books the average price of wool on hand which was bought primarily for L wool was ascertained. To this figure ($36 per 100 pounds) was added 25 cents for handling charges. Since the stained and grey, clips, strings, and loss in sorting amounted to 236 pounds, the shrinkage factor, a little more than 8%, was found by dividing 236 by 2,845, the total number of pounds after subtracting the original allowance for tare. By applying this percentage to $36.25, $2.90 was obtained, which added to $36.25 gave $39.15 as a result. The estimated cost of $1.06 for sorting was added, and the total was $40.21. Since 62.6% of this lot was of L grade, L grade was considered the main product and the S, W, C, and Z grades by-products. Estimates were made as to what the S, W, C, and Z grades were worth free from grease in the market; then the percentage of shrinkage in cleaning was reckoned, in this case 54%. The figures in column 4, those for clean wool, were converted into estimated costs for wool in the grease. For example, if 100 pounds of clean S wool were worth $78, and wool in the grease contained 46% of clean wool, there were 46 pounds of clean wool in each 100 pounds of wool in the grease, each of which was worth 78 cents. By multiplying .78 by 46 it was found that one pound of wool in the grease was worth $.3588, or roughly, 36 cents. The price per pound of each sort of wool in the grease was multiplied by its respective figure in the second column, which showed the number of pounds per 100 there were of the particular sort in this lot of wool. The results of this series of multiplications were listed in column 5, the space for the L grade still being left vacant. The total of this column had to be $40.21 to agree with the average cost as ascertained previously. The figure for the L grade, $29.07, was found by subtraction. Since there were 62.6 pounds of the L grade in each 100 pounds, and since they were worth $29.07, the cost per pound was 46 cents, and the cost per pound clean was $1.00.

The third record (Form 3) in use was the following sorting report from the mill which prepared the tops for the company:

SORTING REPORT FROM MILL

168 Bales Matching	L Grade	37,874
	L Card Waste	98
	L Comb Waste	9
	L Wool Waste	46
		38,027
Greasy Cost	$39.43	
Yield	56.89%	
Clean Cost	$69.31	
Top	84.9 lbs.	$59.95
Noil	15.1 lbs. @ 62c	9.36
		$69.31
Cost of Wool	$0.706	
Comb Cost	.12	

Total of Tops $0.826 per lb.

Sent. . . . . . .38,546 lb.
Actual Tare. . . . 672 lb.
Net. . . . . .37,874 lb.

Quality L. Grade

		Per Cent
75 Bales Tops and Sample	17,783 lb.	46.76
32 Bags Noils and Sample	3,160 lb.	8.30
Dusted Card Waste	54 lb.	.14
Clean Burr Waste	639 lb.	1.67
Comb Bits	9 lb.	.02
Shrinkage		43.11
		100.00

FORM 3.

This form showed the quantity of one grade sent, the actual tare, and the net weight. The net weight was added to 98 pounds card waste, 9 pounds comb waste, and 46 pounds wool waste, on hand at the mill from previous lots. From this amount the mill had produced 75 bales of tops and sample amounting to 17,783 pounds, or 46.76% of the whole; 32 bags, or 3,160 pounds of noils and sample, or 8.3%; 54 pounds, .14% of dusted card waste; 639 pounds, or 1.67% of clean burr waste; 9 pounds, or .02% of comb bits; and a shrinkage of 43.11% had taken place, so that the yield had amounted to 56.89%. The greasy cost of the wool was $39.43 per 100 pounds, and the clean cost was $69.31, which was obtained by dividing $39.43 by 56.89% and multiplying by 100. The mill had produced 3,160 pounds of noils and 17,783 of tops. The total of these two groups was 20,943, of which noils were 15.1% and tops 84.9%. At the estimated cost of 62 cents, 15.1 pounds of noils were worth $9.36, and since 100 pounds of noils and tops in the given proportions were worth $69.31, the value of 84.9 pounds of tops was $59.95, from which the pound cost for tops was found to be 70.6 cents. To this was added the mill's charge for combing, 12 cents per pound, giving a total cost per pound for tops of this grade as 82.6 cents.

In the Fisher Wool Company, when a lot was purchased and sorted, the number of pounds of each class of wool in the lot was multiplied by the market price for that class, and a total market value for the entire lot was ascertained. This market value was compared with the purchase price of the lot, and the difference carried to the Profit and Loss account as a loss or gain.

The Holland Wool Company used a cost method substantially similar to that of the Fisher Company, but it carried the computation a step further to avoid what it believed was an anticipation of profit. When the market price for each class in a lot had been figured, as well as the market price for the total lot, the market values of each class were reduced or increased proportionately in order that the total would agree with the price paid for the lot. These adjusted figures were used as the cost figures for each class of wool.

Should the Harrington Wool Company have substituted the cost method of the Fisher Company or the Holland Company for the method it was employing?

2. CROCKER & LANG VENEER COMPANY[1]

JOINT COSTS: WHAT FACTORS DETERMINE THE BASIS ON WHICH JOINT COSTS SHOULD BE ALLOCATED?

The management of the Crocker & Lang Veneer Company, of Boston, wished to increase its sales of veneer. The company found only about 30% of its logs satisfactory for veneer, and made the remainder into lumber. Three-fourths of the cost of the logs was charged to veneer and one-fourth to the lumber by-product. This distribution of charges allowed a good profit on the manufacture of veneer and at the same time a small profit on the manufacture of lumber. The company was considering decreasing the proportion of the raw material cost charged to veneer, in order to make practicable a reduction in the selling price of the finished product.

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[1] Veneer was a term applied to thin leaves or layers of wood. Generally these were made of valuable wood and laid over a core of inferior wood. Veneer was cut from the logs either with thin saws or with knives, after the logs had been softened by being steamed for several hours.

Th veneer sawed from each log was kept together throughout the processes of drying, flattening, and shipping. The salesmen went out with samples from each log. The samples were selected so as to give the best idea of the color and figure of the lots. As all veneer from one log would react similarly to the same kind of varnish and polishing and would have a similar figure on it, the users of high-grade veneers always desired to obtain the product from one lot for use in one room or on one piece of furniture. Veneer was sold by surface area; the prices were set on the basis of the species and quality of logs from which the veneer was obtained and the beauty of the figures.

About 50% of the material used by the company's veneer plant was yellow birch and hard maple logs obtained from Vermont. Although logs suitable for lumber could be obtained by sawmills for from $15 to $20 a thousand feet, the cost of obtaining logs suitable for veneer was about $50 per thousand feet. This high cost resulted chiefly from the care which had to be exercised in the selection of logs for veneer. The Crocker & Lang Veneer Company sent men from the factory in Boston to travel through the sections of western Vermont where high-grade maple and birch were produced and pick out suitable logs either in the woods or at the mills. Similar methods were employed in the selection of walnut and yellow poplar logs. The cost of mahogany and foreign woods, which the company obtained through brokers in London who were acquainted with the needs of veneer plants, occasionally was more than $200 a thousand feet.

The company had considered charging two-thirds of the raw material cost to veneer and one-third to lumber. The company estimated that if it divided the cost in this ratio, it would experience a slight loss on sales of lumber but would be able to reduce the selling price of veneer so as to undersell competitors and increase its sales of that product substantially.

It also had been suggested that the company charge the cost of the raw material to the veneer and the lumber on the basis of the actual quantities of the raw material used for each product. That is, since 70% of the logs purchased were made into lumber and 30% into veneer, lumber would bear 70% of the raw-material cost and veneer the remaining 30%. This method would reesult in a large increase in the profit on veneer and in a loss on lumber.

Another plan which had been discussed provided that the cost of the raw material be allocated to the products according to the amounts obtained from their sale. Thus, if out of $60 worth of logs, the company made $150 worth of veneer and $30 worth of lumber, the veneer would bear $50 of the expense and the lumber $10.

What policy should the Crocker and Lang Veneer Company pursue in charging the cost of raw material to its veneer and lumber?

What considerations, other than those of a purely cost accounting nature, must be borne in mind?

3. Deven Corn Company—No. 2

JOINT PRODUCTS: HOW SHOULD JOINT PRODUCTS BE TREATED IN COST ACCOUNTING, AND WHERE SHOULD THE COSTS OF A DISTANT FACTORY BE COMPILED?

The home offices of the Deven Corn Company were situated in Chicago, and its plant in Dixon, Illinois. It was engaged in buying corn and converting it into a variety of derived products by processes of separation. Corn was bought by one of the vice-presidents, strictly as required for manufacturing purposes; it was a general principle with the company that the corn inventory should be kept as low as possible, and that there should be no speculation in this commodity upon the exchanges.

The principal groups of products were starches, sugars and sugar syrups, dextrines, oils, and feeds, the latter being sold to farmers for feeding cattle. Of these the oil was by far the most valuable product per pound, but only a limited quantity of it could be secured from the corn processed; the company always endeavored to obtain all the oil which it was possible to get from the materials in process. Next in value were the sugars, starches, and dextrines, of which the management also endeavored to get a maximum yield. These products, however, were alternative to each other; starch was one of the products derived from the early processes of separation of the corn, and it could either be sold as starch in various forms, or could be converted into sugar or dextrines. In this matter the management naturally followed the state of the market as a guide in determining how large a proportion of starch made should be converted into other products, and how much of it should be offered in the market as starch. A number of sales offices and warehouses containing stocks of all products were maintained at important points throughout the country; the head office collated the reports of sales and orders received at all these points, and, upon the basis of the results obtained, issued instructions to the factory upon a manufacturing program.

MANUFACTURING PROCESSES

The corn was first cooked for several hours in a steep house, bringing it to a point where disintegration of the kernel was easy. From the steep house it was conveyed to a mill house where the kernel was broken up and the first main separation effected. The germ of the kernel, containing the oil, and being lighter than the rest, floated off to departments where the oil was expressed from it. The hull of the kernel was also separated at this stage, and passed to departments which converted it into feed. The balance of the materials, containing the greater part in volume, was delivered to a series of table houses where the gluten was separated from the starch. The tables were long and narrow troughs into which the solution carrying the materials ran, the starch settling at the bottom and the gluten running off the top. The latter also was one of the feed products. The starch was delivered to kilns or dry houses where moisture was removed until an ordinary commercial moisture content of about 10% was reached. The starch was then ground into a powder known as common powdered starch in which condition it was available for manufacture into finer grades of starch, into dextrines of various kinds, or for conversion into sugar. The processes by which these various products were made consisted largely of cookings and filterings under a variety of controlled conditions; in the case of sugar, chemicals were added to the starch to induce conversion.

The principal question which arose in the cost accounting work was the apportionment of expenses, and particularly of the cost of corn, between the various products derived from the same raw material. It had become the custom of the industry as a whole to regard certain products as by-products or residues;

the net proceeds of the sales of these products, after charging them with their own advertising, selling, and administrative expense, was credited in the main Manufacturing account, leaving the balance of the expenses to rest upon the remaining products. The products thus treated as residues were the oils and feeds, the former being the most valuable of the products derived from corn, and the latter the least valuable. One purpose of this procedure, in fact the main purpose, was to show costs for the different products which corresponded approximately to their sales values. Inventories of crude oil were carried at current market prices per pound; the costs of refining and canning oil for retail purposes were added to this crude oil cost to get a total unit cost per pound for refined oil in cans.

When the residues had thus been credited in the main Manufacturing account, the remaining expenses, including material costs and conversion costs, were carried to accounts representing the processing of the other products, transfers being made at any one stage at equal values, pound for pound, for the various products which emerged from that stage. The labor and burden costs for the further processing of each product were debited in the account for that product and a total cost thus accumulated upon each finished article.

The foregoing is a description of the cost system in operation in the head office of the company, with the approval of the officers who were actively engaged in the manufacturing and selling sides of the business. Some years ago the company's accountants argued that the treating of products representing over 25% of the total sales of the company as by-products or residues was improper, as it resulted in using any profit which might arise on those products to reduce the manufacturing costs of other products. They added that such cost figures could not reflect the manufacturing efficiencies of the plant at Dixon, and urged that a cost system be installed at the plant which would apportion all costs for material, labor, and burden, among the various products on a strictly accurate basis, pound for pound, exactly as occurred in the plant. No products would be differentiated as being by-products or principal products; all products which passed through the same process would incur the same expenses, and transfers of the same materials to different departments would be at the same rate per pound. One or two of the directors and officers who were interested chiefly in the financial aspects of the business were favorably impressed with these suggestions, and the accountants were instructed to install a cost-finding system at the plant. An extra clerk was accordingly employed at the works office and the head of the office himself undertook the greater part of the cost work as designed. A complete cost ledger was opened containing primary accounts for expenses, and accounts for service and process departments.

The principal result of this system took the shape of a schedule of unit costs which was furnished by this office every month to the superintendent of the plant and to the head office in Chicago. Those who received it for the most part expressed the opinion that it was of no practical value to them. The works superintendent said that the monthly figures were not recent enough nor detailed enough to have practical application in the operation of the plant. The president and the vice-president in charge of sales, both situated in the Chicago office, stated that costs for oil which were less than one-half the selling prices had no business significance and were absolutely misleading; the same opinion was expressed about costs for feed which were far in excess of any amount which could be obtained for them in the market. However, the two cost systems, one at the head office and one at the plant, continued to be operated simultaneously, with the active officers at head office regarding the figures produced by their cost department as accurate and important; while the superintendent of the plant used principally a few significant figures prepared in his office from the various primary reports, but not coinciding with the reports prepared by either of the two cost departments.

After a while this anomalous position was recognized as being somewhat undesirable, and after full discussion of the situation an attempt was made to reorganize the entire cost work in a way which would be satisfactory to all concerned. In doing this the essentials were considered to be, first, that the general trade practices with regard to residues should be recognized, and, secondly, that cost figures should be produced which would reflect the efficiency of the plant. It was admitted that these two purposes need not be satisfied by exactly the same groups of figures, and steps were accordingly taken to develop a set of records and reports which would meet the needs of all parties.

How should costs have been apportioned to the various products, especially to the residues or by-products?

Was there any advantage in distributing costs to products on a strictly arithmetical basis, as was done in the cost system installed at the factory?

Since starches and sugars were alternative products at the option of the management, how should the costs of these products have been found?

In the circumstances described, where should the cost accounting work have been done?

What steps if any would you recommend looking towards a better organization of the company's cost work?

4. Arctic Oil Company

JOINT PRODUCTS: IS IT PROPER TO BASE THE COST OF JOINT PRODUCTS UPON THE MARKET VALUE?

Although the Arctic Oil Company operated its refinery upon the policy of obtaining as much gasoline as possible from each barrel of oil refined, there were, as a result of the refining, many other products produced which were too extensive and valuable to be considered as by-products. As the single material, crude oil, passed through the refining process, gasoline, kerosene, naphtha, wax, gas oil, coke, and lubricating oils were extracted. In one process alone, several of these materials might be made, and several more left in an unfinished state to be further refined in some later process. Depending upon the process used, it was possible to obtain varying quantities of each product, and consequently, the management had, at times, found it best to scrap an entire process in order to obtain more of those materials which demanded a higher price in the market.

The management of this company found it particularly difficult to find a cost of production for each product which they considered exact. Also, because of the fact that the price of all oil products was dependent upon the supply and demand of such a large territory beyond their control, there seemed to be no relation between cost and selling price of the various materials. Furthermore, the value of the oils produced had little or no relation to the volume of crude oil which they constituted. Even though costs of the material entering each process and the expense of operating each process were collected, there appeared to the executives no rational means of distributing these costs to the various oils, other than upon a basis of market value. Accordingly, they used the following system for finding the cost of by-products.

No.	Process	Raw Material	Products
I	Crude Still	Crude Oil	Crude Naphtha Kerosene Distillate Gas Oil Wax Distillate Tar Residue
II	Agitator No. 1	Crude Naphtha	Gasoline Finished Naphtha Wax Distillate
III	Tar Still	Tar Residue	Kerosene Distillate Wax Distillate Coke
IV	Filter Presses	Wax Distillate	Slack Wax Pressed Distillate
V	Sweaters, Filter and Molding	Slack Wax	Molded Wax
VI	Reducing Still	Pressed Distillate	Unfiltered Lubricating Oils Gas Oil
VII	Filters Nos. 1 and 2	Unfiltered Lubricating Oils	Filtered Oils
VIII	Agitator and Bleacher Tank	Kerosene Distillate	Kerosene

Both the figures for cost of all oil entering the process and the direct expenses of operating the process were collected. The indirect costs were allocated to the processes on as accurate a basis as was possible. It was then that this total process cost was distributed to the different products in proportion to the relation their market values held to the total market value of all the products of the same process. In cases where an unfinished material appeared from process, its value was determined by subtracting from its finished market price, the known cost of finishing it. In order to obtain a reliable figure, the market price was always considered an arithmetic average of

SPECIMEN COMPUTATIONS

Description	Gallonage		Average Selling Price Previous Six Months	Cost Factors		Amount	Price per Gallon (Cents)
	Quantity	Per Cent to Total		Product of 2 Previous Columns	Per Cent of Total		
Process I							
Consumed:							
Crude Oil, from stock.	1,000,000[1]					$50,000.00[3]	5.0[2]
Expenses.						3,400.00[4]	.34[5]
Total Process Cost—showing cost per gallon consumed.						$53,400.00	5.34
Produced:							
Crude Naphtha.	300,000[6]	30[7]	10.12[8]	30,360	40.91	$21,845.94[9]	7.28[10]
Kerosene Distillate.	180,000	18	8.18	14,724	19.84	10,594.56	5.89
Gas Oil.	210,000	21	4.08	8,568	11.55	6,167.70	2.94
Wax Distillate.	200,000	10	8.88	17,760	23.93	12,778.62	6.39
Tar Residue.	100,000	10	2.80	2,800	3.77	2,013.18	2.01
Loss.	10,000	1					
	1,000,000	100		74,212	100.00	$53,400.00	
Process II							
Consumed:							
Crude Naphtha							
From Stock.	150,000					$9,600.00	6.4
From Process I.	200,000					14,560.00	7.28
Total Consumed.	350,000					$24,160.00	6.90
Expenses.						1,800.00	.52
Total Process Cost—showing cost per gallon consumed.						$25,960.00	7.42
Produced:							
Gasoline.	262,500	75	13.00	97,500	80.48	20,892.61	7.96
Finished Naphtha.	63,000	18	10.67	10,206	15.85	4,114.66	6.53
Wax Distillate.	17,500	5	8.88	4,440	3.67	952.73	5.44
Loss.	7,000	2					
	350,000	100		112,146	100.00	$25,960.00	

FORM I.

REF. *Accounting for the Petroleum Industry*, MORLAND AND MCKEE; pp. 186–187.

Item	How Obtained
[1] Crude oil consumed.	Summary of gauge reports as kept on process cost ledger.
[2] Crude oil price.	Ledger price at end of month previous.
[3] Total cost of crude.	Product of (1) and (2).
[4] Expenses.	Process expense total.
[5] Expense per gallon.	No. 1 divided by No. 4.
[6] Quantity produced.	Summary of gauge reports.
[7] Gallonage per cent to total.	Actual consumption.
[8] Average selling price previous six months.	Finished product prices are determined from records. Values of unfinished products resulting are computed by deducting from the market price the known cost of finishing.
[9] Amount.	Total cost; percentages in previous column applied to total process cost.
[10] Price per gallon.	Total cost divided by gallonage produced. As is seen in prices of crude naphtha consumed in process II, these prices are carried in after the stock at beginning of the month has been exhausted.

the prevailing prices for the previous six months. In all, this company had eight processes for which these costs had to be figured. They are listed below in such a manner as to show both the raw material consumed and the products coming out of process in each case.

These processes were so arranged that no product was carried back into a previous one. Form 1, with a further explanation following it, indicates the manner in which costs were figured for each process. As a similar system was used for each process, sample computations are only given herewith for the first two, the crude still and agitator No. 1.

This system, the executives claimed, was highly satisfactory for their business, in that it found a cost based on actual data, and which showed a reasonable profit for each article when it was sold. It avoided, they said, the necessity of finding a cost in some arbitrary manner which might result in overstated inventory figures or result in following a poor merchandising policy. In short, it was to them the only method that could be used, considering there was no "main" product. This was particularly so, as they felt the accumulated process figures were sufficient for control over operations.

Does this method of dividing costs between products reflect sufficiently accurate costs for this company?

Of what use might this system be in determining the efficiency of operations, if volume and price varied from month to month, as they do?

In what manner might this system be used as a guide to changing the process from time to time to meet market conditions?

5. Davison Auto Body Company

JOINT COST: HOW MAY PRODUCTS ADDED TO SMOOTH OUT THE SEASONAL ELEMENT OF AN INDUSTRY AFFECT A COMPANY'S PRODUCTION COSTS?

In the production of automobile body parts for other manufacturers, the Davison Auto Body Company had been, until 1918, faced with a difficult problem because of the seasonal variations in demand for automobiles. Since the demand for automobile stampings fell off each year in June and did not pick up again until January, the organization of this company was broken up and much of its machinery left idle for the last six months of the year. Although it was never necessary to shut down the entire plant for this period, the overhead charges were exceedingly high and the expense of breaking in a new labor force each year resulted in unduly high costs.

In order to remedy the situation mentioned above, the management set about to find some steel products which the factory might produce during its slack season. After much research, it was discovered that toy manufacturing offered a possible solution to the company's problem. The production of toys started in June to reach a peak about the end of August, after which time the toy business tapered off until December 1st when all toys had to be on the market for the holiday business. There were other factors too that favored the production of toys. Foreign competition in this line had fallen off greatly in the years just previous to this time because of the war in Europe. Besides, the purchasing power of the American consumers had so increased that they could purchase fairly high priced toys such as steel automobiles, coaster wagons, scooters and wheelbarrows, paying for them as much as $5 or $10 a piece. Also, it was thought by the management, that it would be possible to use some of the waste materials left over from automobile body manufacturing in making the small vehicles. In 1918, therefore, the Davison Auto Body Company started to produce toys.

In less than five years time the company was producing as many as 85,000 all-steel toys a year, with a maximum daily production of 7,500 pieces, making it possible to keep most of the labor force occupied throughout the year on full time. Most of the regular plant equipment could be used in making these toys, although it had been necessary to purchase certain supplementary machines and presses. The heavier stampings such as frames, hoods and body parts, and the tops for the coasters were, for example, turned out on the same large presses as the automobile bodies.

As the management had predicted, it turned out that much waste material could be used up. As high as 50% to 75%

of the waste steel resulting from body stampings, which formerly was sold for scrap, could be used in the production of toys. Although this sheet steel was of a higher grade than was necessary, it lent a certain sturdiness and atmosphere to the toys which gave them an advantage over competitors' products in the market.

How should burden be distributed between toys and automobile bodies in this case?

How should waste sheet metal be charged to toy production?

6. Heidelburg Steel Company

BY-PRODUCTS: ON WHAT BASIS SHOULD A DEPARTMENT BE CREDITED FOR A BY-PRODUCT THAT IS USED AS FUEL IN OTHER OPERATING DEPARTMENTS?

There are many instances in industries, such as the chemical, meat packing, and steel, where commodities are produced under conditions of joint cost, i.e., where two or more products result from the same process or series of processes. Such a situation gives rise not only to peculiar price problems, but also to very troublesome questions of cost allocation. This is especially true when one of the joint products is in the nature of a by-product which can be utilized by the concern in other operating departments.

It was this latter problem that confronted the Heidelburg Steel Company which produced a large variety of iron and steel products. During the spring of 1929, this company installed a gas-washing device whereby gas from the blast furnace could be washed and made suitable for consumption in operating departments where coal and other fuels were previously used. Disagreement arose, however, among the senior executives as to the method of arriving at a proper credit to the blast furnace department for this gas.

The general manager advocated the practice of charging the various departments using this gas at a cost which would be equivalent to the cost of the fuel displaced by this gas. As for the corresponding entry, it was recommended that this amount be credited to the blast furnace department and finally deducted from the pig-iron cost. This policy appeared fair not only to the various operating departments, but also to the blast furnace department. It was clear that the power costs for the operating departments would be no greater under this new arrangement than under the former. As to the latter, it was pointed out that the blast furnace department had by far the strongest claim to be credited with the savings effected, since the benefits arose mainly from that department.

The plant superintendent agreed with the general manager that although it was true that the theoretical cost of this gas would be somewhat more accurate, it was important to recognize that the difference would not be adequate to warrant the tremendous expenses involved in obtaining this true cost. He proposed that the figure at which the blast furnace department was credited should consist of the selling value of the gas minus expenses.

Still a third method was outlined by the vice-president. He made the statement that cost accountants should be primarily interested in presenting figures which reflect the true costs as nearly as they could determine them. In this case, he pointed out, the true cost of the gas would be arrived at by adding all fixed expenses on the new machine to the operating expenses.

After much discussion, the matter was brought to the attention of the president, who gave instructions for a questionnaire to be prepared requesting information relative to the handling of this problem. These were sent to several competing firms who had been faced with the same problem at an earlier time. On the basis of the replies received and the methods proposed by the various executives, the company adopted the method whereby the blast furnace department was credited with the cost of the fuel used in the consuming departments prior to the substitution. The basis used was producer gas at the open hearth department.

In computing the credit, the company used the following formula:

I. Cost of one ton of coal at the open hearth department	$6.36
Gasifying expense	1.98
Total	$8.34

One ton of coal contains 30,720,000 B.t.u.'s; operating at 87½% efficiency, there are produced 26,880,000 B.t.u's.

II. 26,880,000, B.t.u.'s equal 47.2M public feet coke oven gas, or 283M cubic feet blast furnace gas.

On the basis of these figures, the value of:

$$\text{Coke Oven Gas per M. cubic feet} = \frac{8.34}{47.2} = \$0.1766$$

$$\text{Blast Furnace Gas M. cubic feet} = \frac{8.34}{283} = \$0.2947$$

From this gross credit, however, it was necessary to deduct the various expenses incurred in the operation of this gas-washing device, as well as the cost of delivering the gas to the various consuming departments. The management was aware that while this procedure did not result in any reduction of fuel costs for the operating departments, they were benefited by the reduction in pig-iron costs to the extent of the gas credit.

All the executives were by no means convinced that the above plan was not defective in some respects. In the first place, there was the problem as to whether it was considered conservative policy to credit the blast furnace department with the selling value of the gas minus expenses, rather than credit it with the theoretical cost as proposed by the vice-president. They understood that in some industries it was customary to establish a cost on by-products such as this blast furnace gas on the basis of the weight plan. There seemed to be no doubt, however, that the reason for this procedure was the fact that some of these by-products often became the main products and were sold to the public. To the Heidelburg Steel Company the gas was, however, simply a by-product and there was no intent whatsoever of marketing it to outside consumers. For this reason, it was felt that all the savings effected by the development and utilization of this blast furnace gas should be devoted to reducing the pig-iron costs.

Do you agree with the company's method of finding the net credit to the blast furnace department? If not, what method would you recommend? Why?

Comment upon the methods outlined by the general manager, vice-president, and plant superintendent.

B. COST FOR DIFFERENT PURPOSES

1. Barrington Production Company

ESTABLISHING FOREIGN PLANT: WHAT FACTORS MUST A MANUTURER CONSIDER IN ESTABLISHING A FOREIGN PLANT?

The Barrington Production Company manufactured a series of mechanical devices with which it enjoyed an increasing foreign trade. Of all its foreign business, the trade with the Orient was tending to be the most rapidly growing, but, because of adverse tariff rates, it was the trade on which the company made the least profit. Since there was no reason to believe that the tariff would be altered in a manner favorable to the company's business, the company was contemplating building a factory in Japan to take care of the trade in that part of the world.

In approaching the problem of establishing a plant in Japan, there were three important factors to be considered: the first was that of selecting the city in which to locate; the second dealt with the cost of building and the type of building that would be best in that country; and last, and perhaps most important of all, was the question whether it would be most economical to equip the factory with all the latest mechanical devices and machines or whether it would be wiser to build the plant for hand labor on the assumption that labor was plentiful, cheap, and little accustomed to the use of mechanical devices in manufacturing. Since the establishment of a foreign factory was a new undertaking for the Barrington Production Company it wished to make a thorough study of all the factors mentioned before it began to spend any money on the project.

So far as the selection of a city was concerned, statistics as to population, number of manufacturing companies operating in any of the leading cities in Japan, and approximate number and type of laborers available there, could be secured from printed sources and from the Department of Foreign and Domestic Commerce in this country. Furthermore, information as to topography of the land, climate, and transportation service was available. The company intended to investigate all of these sources, after which it expected to send one of its engineers to Japan to survey the country generally, but to pay particular attention to those sections which appeared to be good for its purpose from the studies made.

In regard to the second factor, the executives of the company believed that the best way to obtain satisfactory results was to communicate with several contracting firms in this country which had constructed one or more buildings in Japan. In addition, the company's engineer would make a careful study of buildings and building costs while he was in Japan. This question and the first did not give the company any great trouble, because, by observation and personal surveys on the part of the company's engineers, a fairly satisfactory result was assured.

The greatest problem was that of determining whether it would be cheaper to produce by hand labor or by machines. The company intended to supply its cost accountant with data relative to rates of wages, approximate productive capacity of the workers, available supply of skilled and semi-skilled workers. The cost accountant already knew what machinery set up in Japan would cost and its probable output. From these data the company's executives expected the cost accountant to make the necessary calculations to inform them which method of production would be the cheaper. If hand production seemed to be the cheaper, the company intended to ascertain, if possible, the speed with which the Japanese people were adopting machine production for, obviously, if they were adopting modern devices rapidly it would be unwise for the Barrington Production Company to build a plant for labor for the saving it might give at the time.

How valuable do you believe a cost accountant's contribution might be in a case like this?

From a cost standpoint do you believe the company's approach to the problem was sound and thorough?

2. KNICKERBOCKER CHAIN COMPANY

UNIFORM COSTS: WHAT SITUATIONS MAY GIVE RISE TO THE DEVELOPMENT OF A UNIFORM COST SYSTEM?

There were in the chain industry a number of fairly large companies directly competing with each other. These companies could be grouped into three classes, namely, those that produced quality chain only, those that produced the same types of chain as the first group of companies but of cheaper grades, and, lastly, those companies that produced both quality and cheap chain. The Knickerbocker Chain Company was in the first group, and, within its class, it was a low-cost producer, but the latter fact did not prevent the company from experiencing certain difficulties. On certain kinds of power drives, a chain of the cheaper grade would serve as well as a quality chain, for on these jobs the precision of measurement and workmanship on the chain was less important than its tensile strength. The material in the cheaper chains was almost as good as that in the quality chains, but the latter were produced with more highly skilled labor. It was the class of trade having power drives on which the cheaper chain might be used, that gave the Knickerbocker Chain Company trouble, particularly if an installation was new. Customers with this type of drive would ask the Knickerbocker Chain Company's engineers to develop a chain which would satisfactorily take care of the power drive in their plant; the cost of this development work averaged about $20,000 a year; as much as $15,000 was spent on one job of this sort. After the chain had been developed by the Knickerbocker Chain Company, the customer would frequently submit the sample of the chain to companies in the second group, who made a cheaper chain, to see what price they would quote to reproduce it. The price was always slightly less than the Knickerbocker price, with the result that the Knickerbocker Chain Company stood the cost of the developmental work while its competitors secured the business. The Knickerbocker Chain Company could not avoid such situations, for it could not afford to jeopardize its reputation by having customers say that it would not cooperate; at the same time it could not produce a cheaper product because it did not wish to "trade down" and thereby risk its reputation as a quality chain producer.

The vice-president of the company who was in charge of the accounting work was of the opinion that part of the difficulty was brought about by lack of adequate cost systems on the part of some of his competitors. Consequently, he invited all of the chain manufacturers to a meeting in which the possibilities of developing a uniform cost system for the industry might be discussed. The meeting was held, but the idea of a uniform system was coolly received; most of the manufacturers felt that their cost work was adequate and that the variations in prices were caused primarily by differences in organization and production methods between the various companies, and the position each occupied in the industry.

What advantage, if any, would a uniform cost system have given the various companies in this industry?

How should the $20,000 yearly experimental costs of the Knickerbocker Chain Company be accounted for?

3. GLENDOWN MANUFACTURING COMPANY

COST REDUCTION: WHAT STEPS MAY BE TAKEN WITH THE VIEW TO REDUCING MATERIALS COST?

The Glendown Manufacturing Company was a large concern producing electrical goods in great variety. The company did as large a volume of business as some which, in other lines of business, were able to organize production on a mass basis; but because of the large number and variety of products and parts turned out by the Glendown Manufacturing Company, it had not been able to advance nearly so far in this direction as it wished. From time to time the possibilities of simplifying the line were considered from different angles, in the hope that eventually certain leading products could be organized on a quantity production basis. The company's officials had, for example, developed a scheme of "preferred numbers," seeking to find, in the range of different sizes and designs for any one product, those which either were already the best sellers, or could by engineering administration be shown to be the most generally serviceable for a large number of purposes; intervening sizes and designs would then be regarded as candidates for omission from the company's line. A study of the different uses to which small motors were put, for example, suggested that certain minimum advances in horse-power ratings would furnish a variety sufficient to meet all practical needs. Assuming, for example, that this minimum fraction was ascertained to be ¼ of

1 horse-power, then the range of sizes would be ¼, ½, ¾, 1, and so on, as long as this scale held good; if the scale were finally adopted as the result of much engineering and marketing study, it would mean that such sizes as ⅛, ⅚, or 15/16 horse-power motors would be dropped from the line. While this procedure might occasionally arouse objection from some present users of motors, the company endeavored to study the problem sufficiently before taking any step to be sure that the majority of such users could be diverted to the use of the standard units; in the case of new users the Glendown Manufacturing Company was nearly always able to demonstrate to them the advantages of using one of the standard sizes rather than of selecting something out of the ordinary. The company had already experienced considerable success in this direction, and the number of different parts which had thus been eliminated was very large.

MANUFACTURE OF NON-CURRENT RENEWAL PARTS

Another phase of this same problem occurred with the manufacture of parts for equipment which was no longer listed in the company's catalogues, but the parts of which were frequently called for by customers for repairs and renewals. Many types of equipment continued to be used by customers for years after they had been dropped from the Glendown line; the total number of parts which it was thus necessary to keep in stock had grown to enormous proportions, yet the quantity which could be scheduled as a manufacturing run for any one of these parts was quite small. The production department had felt itself seriously handicapped in its efforts to produce regular lines at low costs by having thousands of small orders for these obsolete parts constantly mingled with major production orders for current material. A solution was eventually found for this difficulty by erecting a special plant to be devoted wholly to the manufacture of non-current parts, thus relieving the regular producing departments of this work. The move was found to be very successful, and worked to the advantage both of current material manufacture and of the production of obsolete parts. With a separate staff assigned to the latter work, constant thought was given to the problem of simplifying the renewal parts business by reducing the number of different parts. Some surprising results were obtained in this direction by adapting some one shape or design to serve the purpose, for which three or four different designs were previously used.

PARTS OF CURRENT DESIGN

Similar studies were made of the parts entering into current products. In this case a considerable impetus was given to the work by an investigation of the material handling costs; the results disclosed by the reports on that subject showed very clearly the costly and unprofitable results of using such a wide variety of parts. Some parts were made in such small quantities, yet required so much handling and clerical work, that the cost of the latter amounted to a quite unreasonable proportion of the total manufacturing cost. Efforts were accordingly next made to influence the department of engineering and design; this department, if left to itself, would frequently design equipment to include odd sizes of screws, bolts, plates, and other common parts, in places where a more standard design would do perfectly well. An organized effort was made to have the engineering and design department adhere to the use of a limited number of standard parts for as many different purposes as possible.

In what ways would the adoption of "preferred numbers" tend to reduce costs?

What advantages do you see in the establishment of the special plant for the manufacture of renewal parts?

What facts would be likely to appear from a study of material handling costs which would lead to attempts to control engineering design?

4. Brisbane Small Products Company

COST REDUCTION: HOW MAY THE PROBLEM OF COST REDUCTION BE APPROACHED?

The business of the Brisbane Small Products Company had been established and built up to a large extent on the basis of patented products, which had had a ready market and on which large margins of profits were easily obtained. With this background there had been, in the main, two policies formulated upon which the operations of the concern rested. The first of these was that an extensive search be maintained for new inventions and new markets, and that a large development program be carried out for the improvement of old products and the perfecting of new ones.

The second policy developed was the result of the easy profits that had been made during the first few years of operations, and was based on the opinion that profits should be maintained by getting an ever increasing volume of sales to absorb overhead with little regard for the expenses incurred in the operations of the business.

In 1928 the wisdom of these policies was called seriously to account when the following chart (Chart 1) was placed before the executives; the striking results there shown, and the probable disappearance of profits in the near future, led to the employment of consultants to make a study of the situation; in their report the matters here mentioned were brought out.

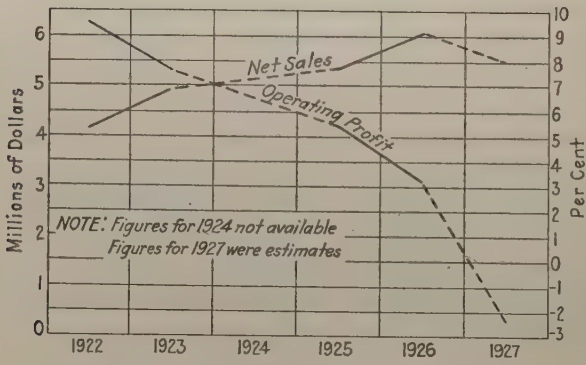

CHART I.

The responsibilities of the executives in the company were not definitely outlined or clearly established. Mr. Potter, the president, was a member of the original concern and, although technically the head of the company, he actually devoted his activities chiefly to the engineering and product development work of the firm, leaving the general management in the hands of the two vice-presidents. This arrangement did not work out very well, as the two vice-presidents had equal authority and, as they did not hold the same views of what should be done on all subjects, there was constant confusion and hesitancy on the part of the officers throughout the organization in carrying out their duties.

One of the vice-presidents, Mr. Avery, held the position of secretary and was also in charge of sales and production. He had been associated with the concern for many years and, although he undoubtedly had the best interests of the firm at heart, he was not sufficiently strict and aggressive to obtain the best results. The other vice-president, Mr. Peters, held the position of treasurer, and while in charge of the financial policies of the company he in addition maintained close contact with the production and sales work. In the main, he opposed the general policies being carried out and wished to have a closer control set up over the costs of the concern, stabilizing the business on the basis of a normal sales volume of standard products. Having control of the finances he was to some extent able to impress his views on the organization, yet on the whole the other policies were predominant.

Throughout the war period, the company was quite prosperous, but in 1921 suffered a heavy loss. However, this was not held to reflect too heavily on its management, as many other firms suffered similar losses during the depression. Starting with 1922, an intensive sales effort was undertaken and, as shown in Chart 1, sales were materially increased each year up to 1927. The decrease in 1928 was considered to be due to general business conditions and not to any difficulties inherent in the company. The profit curve in Chart 1 showed that the percentage of operating profit had declined steadily and, in 1928, with the falling off of sales, it was estimated that there would be a substantial deficit. Such a condition was serious for the company, as in addition to an outstanding bond issue, it had to obtain a substantial amount of money from the note market and also carry a heavy line of bank credit.

A chart (Chart 2) was drawn up, from the following statistics, and was designed to show clearly the tendencies of the major groups of expense in the company:

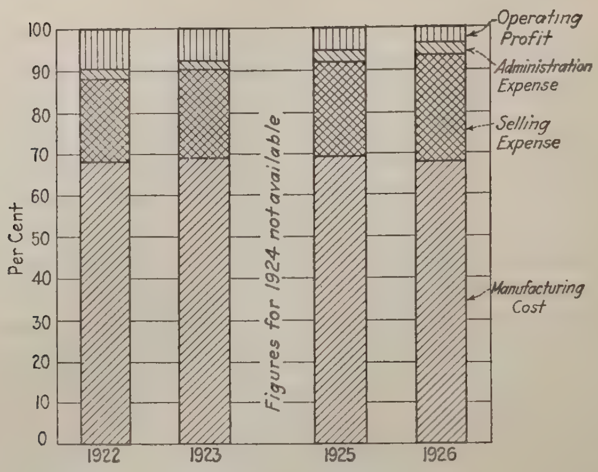

CHART 2.

	1922	1923	1925	1926
Manufacturing Cost of Sales.........	67.98%	68.95%	69.11%	67.90%
Selling Expense....................	19.90	21.18	22.79	25.57
General Administration Expense......	2.54	2.08	2.51	2.70
Operating Profit....................	9.58	7.79	5.59	3.83

It was pointed out that the probable reason that manufacturing cost of sales had remained so nearly constant was that nearly all operations in the plant were performed on the basis of standard cost, which tended to stabilize expenses. The decreasing profit margin was clearly due to the increased percentage of selling cost, to which several factors contributed. There had been a decrease in the sales of some patented articles on which a large profit was obtained; on one of the general lines close competition had materially reduced the returns, and hand to mouth buying had decreased the size of orders received and increased the percentage cost of handling them. However, the factor which was probably most significant was that the sales expense had never been budgeted or controlled and there was, therefore, no adequate incentive to keep the costs down.

On the basis of the general set-up of the company and the outline of the existing situation and tendencies, it was pointed out that conditions required immediate executive action, and that the fundamental problem requiring a decision was the question which of the two policies held by the vice-presidents was to be adopted. Such a decision would be followed by a unity of control and purpose throughout the organization which could not otherwise be obtained.

During the discussion as to the best policy to be followed, the difficulties of maintaining a profitable business on the basis of patented articles were brought out; when patents expired direct competition could be expected if an article was at all profitable. There was also the uncertainty as to whether protection could be maintained; the issue of a patent did not mean that the courts would uphold it when contested by another party, and in many quarters the taking over of a patent was regarded as a probable way of becoming involved in expensive litigation. There was difficulty in obtaining the rights to patented articles from inventors on reasonable terms, and the possibility that they might not prove profitable in the end. Further, development work for new items was expensive and the results uncertain, so that the lack of satisfactory products might well prove the undoing of the company.

On the other hand, it was shown that the outstanding corporations of the country were operated on the basis of an assured volume of business because of adequate merchandising methods, and that business could be handled at a profit because of maintenance of their production technique. Such companies, it was admitted, spent large sums on research and development, but did not rely fundamentally on those activities to maintain the life stream of the business. That there had been exceptions was true, but such examples did not minimize the difficulties and dangers of the plan.

It was, therefore, suggested that a definite policy of stabilizing the company's sales on the basis of quantity production of standard products be adopted. Such a decision called for a reorganization of the management, so that a unified control featuring this policy would be obtained. Without bringing additional men into the organization, it was clearly evident that the change required should be to place Mr. Peters in full charge; it was therefore recommended that he be elected chairman of the board of directors and also retain his office of treasurer. Mr. Avery would be appointed president and keep the control of the production and sales activities under the direction of Mr. Peters. Mr. Potter would be left in charge of the engineering and development work of the company, holding the position of vice-president. Such an arrangement would establish the predominance of the policies recommended and work for an intensive program of cost reduction.

The consultants next proceeded to estimate, on the basis of their experience, what the company should be able to accomplish, provided the policy was adopted. The method of approach was to estimate the sales volume which could be considered normal, and then analyze by groups the expenses of the concern for the preceding year, showing what saving they considered it possible to make.

It appeared that a reasonable estimate of the normal sales volume that could be developed and maintained without undue expense on the standard lines manufactured by the company was approximately $6,000,000. The problem facing the company, therefore, was to organize and control its operations in such a way that with this amount of business normal profits could be made.

For the discussion of the possible savings that might be made, Form 1 was prepared; expenses were divided into two groups made up of controllable and non-controllable items. The significant fact here shown was that, out of a cost of sales of about $6,000,000, slightly more than 60% was made up of items which could be controlled by the management. Further, of these controllable factors, approximately two-thirds was for wages and salaries of employees throughout the company. Taking these figures as a whole, it was believed that with a budget control based on $6,000,000 of sales, a minimum saving of $275,000 could be made; savings greater than this amount would depend largely on the cooperation and support given to the new policies by the management.

Looking for the particular items which it was believed could be reduced, the factory productive payroll of approximately $775,000 was first considered; of this amount about 65% was earned under an incentive wage system used in the plant. The

PROFIT AND LOSS STATEMENT

(*December* 31, 1926)

Total Sales			$6,215,355.48
Cost of Sales:			
Non-controllable:			
Materials	$1,995,466.86		
Fixed Charges	246,177.41		
Discount on Sales	119,355.33	$2,360,999.60	
Subject to Control:			
Payroll			
Factory, Productive	$ 773,233.79		
Dept., Non-productive	434,775.33		
General	485,105.09		
Selling			
Administrative	43,297.60		
Advertising	46,391.08		
Salesmen	284,257.49		
Office	151,353.27		
Warehouse and Shipping	124,739.45		
Administrative	57,867.63		
	$2,401,020.73		
All Other Overhead	1,215,241.46	3,616,262.19	
			5,977,261.79
Operating Profit			$ 238,093.69
Miscellaneous Income:			
Discount on Purchases		$ 35,539.19	
Interest on Royalties, etc.		16,593.14	52,132.33
			$290,226.02
Miscellaneous Deductions:			
Interest on Borrowed Money		$ 150,902.86	
Discount and Commission on Bonds and Shares		15,466.31	166,369.17
			$123,856.85

FORM 1.

effectiveness of the system was, however, seriously questioned after observation of conditions in the shop. The consultants maintained that an experienced shop executive could tell by walking through a plant what was the general "pace" being set by the workers, and that there was a distinct difference between the pace set in a day-work shop and in an incentive wage shop where rates were set "as tight as they should be." In the plant of the Brisbane Small Products Company, it was considered that the "pace" was more comparable with that usually found in day-work shops than under properly organized incentive wage systems. With such a condition, savings could certainly be made. Just how much these costs could be reduced would have required a detailed survey, but an estimate of $27,500 was suggested as reasonable.

Warehouse and shipping payroll amounting to about $125,000 was closely associated with productive labor. In this division, it was found that there was a gang of about 40 men employed as order-pickers, packers, and box-makers; such activities as these were said to be the most fertile field for making savings in labor costs as the work was not governed or controlled in any way by the speed of a machine. It was true that it might be difficult to measure and standardize that type of work, but experience had shown that it could be done satisfactorily and that the savings to be expected from such a program should be between 20% and 40% of the labor cost. A conservative estimate of the labor savings which might be expected on this item of expense was set at $13,500.

The item known as general payroll amounted to nearly $500,-

ANALYSIS OF THE GENERAL FACTORY PAYROLL

(*Year*—1926)

Administrative Salaries	$ 28,752.84
Auto Labor	3,230.07
Clerical Labor	107,275.32
Engineering Department Salaries	12,181.17
Employees Welfare Salaries	721.67
General Maintenance Labor	63,672.21
Industrial Relations Department Salaries	11,786.52
Purchasing Department Salaries	19,648.99
Receiving Department Salaries	3,566.72
Interdepartment Labor	178.47
Repair Labor	43,640.95
Savings and Loan Association Salaries	2,112.00
Planning and Scheduling Department Salaries	27,984.42
Methods Department Salaries	20,140.82
Stockroom Salaries	17,516.27
Supervision	30,500.93
Factory Supplies Labor	5,863.37
Product and Development Labor	86,332.37
	$485,105.09

FORM 2.

000. Probably some expenses included in such a category could easily be reduced by an intensive study of the work being done. In order to be able to comment in more detail upon such items as experience had indicated to be most susceptible to reduction, the general payroll was analyzed as shown in Form 2.

The first item in this schedule to be considered was that for clerical labor amounting to $107,000; it appeared that a big reduction could be expected if a determined effort were made to control the activities under this head. In connection with planning, scheduling, and methods departments, there was a possibility that some reductions might be made although no certainty was expressed. The last major item to be commented on was the $86,000 for product and development salaries, divided between three kinds of activities as follows:

1. Manufacturing and engineering.
2. Improvement and development of existing products or closely related types.
3. A wide search for new inventions in old or new markets.

A change in the major policy as recommended would allow for a definite saving to be made on the third item and possibly some of the other two.

The item of office expense given on Form 1 was considered susceptible to reduction while the item "All Other Overhead" was a wide field for investigation which should prove fruitful.

In Form 3 was given an analysis of the Cost of Sales under the three principal divisions of expense: manufacturing, selling, and administration. In the manufacturing division, the item of factory supplies seemed to present a field where the cooperation of the foremen might be obtained by the employment of an incentive to show a reduction.

Under "Selling Cost," the advertising item was first commented on. As given, it amounted to 5.77% of the sales volume, but the expenses for the year had been about $66,000 greater than the normal set, which would make the adjusted percentage about 4.7. The opinion expressed was that such an amount was more than was spent on similar products by other companies and it was known that the average advertising expenditure of some firms on a line similar to the one carried was less than one per cent.

ANALYSIS OF COST OF SALES

(*Year Ending December* 31, 1926)

Manufacturing Cost of Sales:		
Materials	$1,995,466.86	
Fixed Charges	151,736.76	
Payroll—Productive	773,233.79	
" —Dept.—Non-productive	434,775.33	
" —General	485,105.09	
Factory Supplies	196,249.15	
All Other Manufacturing Expense	183,252.84	$4,219,819.82
Selling Cost:		
Fixed Charges	$ 26,250.10	
Discount on Sales	119,355.33	
Advertising	358,623.21	
Administration	43,297.60	
Salesmen—Salaries, Commissions and Traveling Expense	411,661.16	
General Expense	276,941.45	
Shipping Expense	198,950.32	
Warehouse Expense	44,079.38	
Freight Expense and Cartage	110,275.31	1,589,433.86
Administration:		
Fixed Charges	$ 31,227.79	
Salaries—Officers	34,365.89	
Salaries—Office	23,501.75	
Patent Expense and Litigation	27,458.75	
General	51,453.93	168,008.11
		$5,977,261.79

FORM 3.

The situation apparently needed a thorough analysis to see what the percentage expense should be, and it was thought that savings undoubtedly could be effected.

Salesmen's commissions and traveling expense of over $400,000 was an item which would have had to have been analyzed further, before a definite idea could have been obtained of whether it was out of line or not. It was recognized that such costs varied for different products, lines, classes of trade, and parts of the country. However, as the total was somewhat more than 6.6% of the sales volume, the opinion was expressed that a correctly developed incentive wage or bonus arrangement coupled with a close control of traveling expenses should reduce the cost.

This discussion of particular items was not supposed to limit the field in which reduction of costs should be attempted; but on the basis of the experience of the consultants those items probably offered the best opportunity to make immediate savings.

In connection with this program, it was thought that certain arrangements should be made to avert any detrimental effects on the morale of the organization, and to enlist the active support of the principal executives who would be connected with the work. It was pointed out that because of declining profits, many of the officers had had no increase in salary during the past few years, which they were really entitled to because of their increasing worth to the company, and that an intensive program for economy would tend to arouse criticism and opposition unless some additional returns were forthcoming.

The arrangement proposed by the consultants to meet this difficulty was called a "key man" executive bonus. In use, this plan would arrange for the reward, in addition to regular salary, of the executives selected, on some basis which would reflect the efficiency of operations and the consequent savings made during a year's period. In this way, the amount of the bonus would be directly related to the cooperation and endeavors of the various men in putting into effect the cost control program. Such men as the chief engineer, the works manager and his assistant, the heads of the sales, advertising, and finance departments would assuredly be included in the bonus plan and probably some of their chief assistants. A definite opinion as to whether the bonus should be a certain percentage of the savings made or whether it should be taken out of the profits at the end of the year after a fair amount had been set aside as recompense for the use of capital, was not expressed, although the latter procedure was considered desirable. However, as long as some equitable procedure was devised, it was believed that the cooperation of the officers would be obtained and the program of cost reduction would thereby be carried forward far more successfully than could otherwise be expected.

What would be the best basis on which to enlist the cooperation of the foremen in reducing to a minimum the cost of factory supplies?

What detailed information could well have been rendered supporting the contention that the business should have been established on the basis of standard products?

Under what conditions should a company consider that it must depend on its research and development department for the articles on which it is to make its profits?

If a company has built up its business on the basis of patented articles, what would be the controlling factors in determining if such a policy should be indefinitely continued?

Would you favor paying the executives a salary high enough to obtain their best efforts, or arrange a bonus plan which would be expected to develop their full cooperation?

If a bonus were to be paid, would you favor one computed upon the profits at the end of the year, or upon the efficiency of operation or savings made?

5. United States Tariff Commission

COST OF PRODUCTION: WHAT IS THE INFLUENCE OF COSTS IN DETERMINING IMPORT TARIFF RATES?

The United States Government has adopted the principal of fixing tariffs at rates which will equalize the difference between the costs of production in this country and in the principal foreign producing countries. The situation may be illustrated by taking the case of taximeters, upon which a report was made to the President on September 23, 1925.[1] From this report the following extracts have been taken.

References to Files.—The basic documents in connection with the investigation on taximeters are in the files of the Tariff Commission and are available to the President. They comprise the transcript of the public hearing, the original cost schedules, and other data. These include confidential data the disclosure of which is forbidden by section 708 of the revenue act of 1916.

Sec. 708. It shall be unlawful for any member of the United States Tariff Commission, or any other officer or employee, agent, or clerk of said commission, or any other officer or employee of the United States, to divulge, or to make known in any manner whatever not provided for by law, to any person, the trade secrets or processes of any person, firm, copartnership, corporation, or association embraced in any examination or investigation conducted by said commission, or by order of said commission, or by order of any member thereof. . . .

[1] *Taximeters Report of the United States Tariff Commission to the President of the United States;* Washington Government Printing Office, 1926.

Then follow citations of the rates of duty applicable to taximeters, as given in the various tariff acts.

History of the Investigation.—On May 4, 1923, the Tariff Commission ordered an investigation of taximeters for the purposes of section 315 of the tariff act of 1922. An application for an investigation looking toward an increase in the duty on taximeters was received from the Pittsburgh Taximeter Co., of Pittsburgh, Pa., on December 28, 1922. The investigation of costs of production in the United States and the principal competing foreign countries was conducted from June to December, 1923.

Public notice in the usual form was given by posting in the Washington and New York offices of the commission and by publication in Treasury Decision and Commerce Reports. After due public notice, as prescribed by law, a public hearing was held at the office of the commission in Washington on February 12, 1924, at which hearing all parties interested were given reasonable opportunity to be present, to produce evidence, and to be heard with regard to the differences in costs of production and all other data and conditions enumerated in section 315 of the tariff act of 1922 with respect to taximeters.

After this the report summarizes the information which has been brought to light by the Commission's investigations, especially with regard to the raw materials used, the production and consumption of taximeters, the imports, exports, and prices. Then follows the material given below on cost of production, with the conclusions of the Commission.

Domestic Costs.—Taximeters are patented articles. The meters made by different manufacturers show marked differences in design and number of parts, and some of them register more information than others. Because of these physical differences no comparison can be made on the basis of physical comparability. The commission has, therefore, selected for its cost study data collected for those meters that perform comparable functions or that serve the same use to the taxicab operator and his patrons.

In conducting its field work the commission made a complete canvass of the domestic industry, obtaining cost data directly from the books and records of all establishments manufacturing taximeters comparable in functions to imported taximeters. The figures in this report, therefore, are limted to those of companies making taximeters comparable in use to the imported meters. Of the four establishments visited only two produce taximeters closely comparable with the Argo taximeter made in Germany.

The data obtained from the two American establishments, the Pittsburgh Manufacturing Co. and the American Taximeter Co., manufacturers of the "Pittsburgh" and "Atco" taximeters, respectively, are for periods of 6 months for the former company, and 12 months for the latter, ending in 1923.

Foreign Costs.—The commission's foreign investigation of costs of production was confined to the two most important establishments in Germany, the larger of which had been extensively shipping its product, the "Argo" meter, to the United States. Although the commission's representatives had access to the records of the establishment producing the Argo taximeter, it was not possible to obtain figures covering production over a long period of time, because the firm was also engaged in clock manufacturing, and the books showed no segregation of the costs of the two products until 1923. Then, too, investigation occurred during a period of transition from accounting in paper marks to accounting in gold marks. It was not until November, 1923, that the reorganization work had advanced sufficiently to enable the factory to set up cost statements in gold marks, based on an operating statement likewise in gold marks. The cost statements obtained by the representatives of the commission were as of December 1, 1923.

The rates of duty required to equalize the differences in costs of production of domestic and foreign taximeters are based upon a comparison of costs for two American companies and one German company. Publications of the costs of production of these companies would reveal the operations of individual manufacturers and disclose confidential information contrary to the provisions of section 708 of the revenue act of 1916 hereinbefore quoted. The detailed costs of these companies are shown in the confidential section accompanying this report.

FORMAL STATEMENT OF CONCLUSIONS

1. Germany is the principal competing country.

2. The difference in costs of production between taximeters, the product of the United States, and similar meters imported from the principal competing country is $40.98 per meter, without transportation and other charges from the factory in Germany to the common market in New York City, and $39.66 per meter if such transportation and other charges be included.

3. The present duty on taximeters of 45 per cent ad valorem and $3 per meter does not equalize said difference in costs of production.

4. The difference in said costs of production in the United States and in Germany cannot be equalized by proceeding under the provisions of subdivision (a) of section 315 of the tariff act of 1922; that is to say, by increasing the duty to the extent of 50 per cent of existing duty applied to the value of the imported article in the country of exportation. The duty shown by such difference in costs of production necessary to equalize the same is $3 per meter and 27.1 per cent ad valorem upon the American selling price of similar

domestic taximeters as installed if transportation and other charges are not included, and $3 per meter and 26.2 per cent ad valorem upon such American selling price if transportation and other charges are included.

5. Chairman Marvin and Commissioners Baldwin and Brossard are of the opinion that transportation and other charges referred to above should not be included in costs of production; Vice-Chairman Dennis is of the opinion that transportation charges should be included in such costs.

THOMAS O. MARVIN,
Chairman.

ALFRED P. DENNIS,
Vice Chairman.

A. H. BALDWIN,
E. B. BROSSARD,
Commissioners.

NOTE.—Commissioner Glassie, being in Europe on the Commission's business, did not participate in the consideration or the preparation of this report.

The President of the United States accepted these recommendations and issued a proclamation fixing the rates at the amounts recommended by the Commission.

More detailed examples of the type of cost data gathered by the Commission are given in its sugar report,[1] in which the Commission felt free to divulge the figures it had gathered in the forms as given below. Numerous tables are quoted for cane and beet sugar in various parts of this country and in the principal foreign producers, together with a great deal of additional data bearing upon the subject.

THE COST DATA ON THE SUGAR INDUSTRY OBTAINED BY THE COMMISSION

Summaries of the data relating to the weighted average costs[3] of sugar production in regions of the United States and Cuba for the years covered by the Commission's present investigation, and by others

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[1] *Sugar Report of the United States Tariff Commission to the President of the United States;* Washington Government Printing Office, 1926.

[2] The word "cost" is here used for the sake of simplicity, but, as will be shown later, the figures for several regions represent annual expenditures for production rather than actual cost.

WEIGHTED AVERAGE COST OF SUGAR PRODUCTION, IN CENTS PER POUND—CUBA

	1922–23*
Cost of cane†	2.3832
Manufacturing expense	.2715
Repairs and maintenance	.1909
Administration	.1815
Fixed charges (excluding interest)	.3080
Total above	3.3351
Credit for receipts from by-products	.0234
Net cost f.o.b. mill (excluding interest)	3.3117
Investment cost on basis of 6% of invested capital‡	.5684
Net cost f.o.b. mill, including above investment	3.8801
Investment cost on basis of interest actually paid plus 6% on owner's equity§	.5675
Marketing cost, including transportation¶	.2410
Net cost, including both marketing and investment	4.1211
Receipts from sale of sugar	4.5597
Profit or loss, f.o.b. mill basis, investment and marketing costs deducted	.4386
Total production of crop, long tons	3,602,910
Number of mills covered by above cost data	76
Per cent of total production covered by above cost data	50.4

* See *"Second Preliminary Statement of Cost Data, etc.,"* issued by the Commission February 27, 1924, for description of these 1923 data, the sanctions under which obtained, etc., pp. 3–14.

† Includes cost of company-grown cane, expenditures for purchased cane, expenses of transportation of cane to factory, etc.

‡ Includes borrowed capital and owner's equity.

§ After adjustments for miscellaneous income and expenses due to collateral operations not directly connected with sugar production have been made, such as interest and rents received wherever such adjustments are required to place mills on comparable basis.

¶ Includes only such marketing expenditures as are incurred by the mills, not the cost of marketing and transportation of sugar from the mill to United States ports.

conducted by it prior to the enactment of section 315 of the tariff act of 1922,[1] are presented in Tables V to X, inclusive.

Only the main items of cost, such as cane costs, factory costs, etc., are shown in these tables. Greater detail, together with the basic tabulations from which these weighted average costs are derived, is included in Appendix V.[2] The item "cost of cane" or "cost of beets" represents the costs of such cane or beets delivered at the mill. It includes, therefore, the cost of company-grown cane or beets, the expenditures for purchased cane or beets, and the expenses of their

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[1] See *Preliminary Statement of Cost Data* issued by the Commission December 1, 1923, in Appendix II (not printed), for methods employed in securing these data, the sources of the pre-war data, the nature of the 1923 data, etc.

[2] Not printed.

WEIGHTED AVERAGE COST OF SUGAR PRODUCTION, IN CENTS PER POUND—UNITED STATES BEET SUGAR

	1922–23
Cost of beets*	3.3720
Manufacturing expense	1.1059
Repairs and maintenance	.3068
Administration expense	.2992
Collateral operations affecting manufacturing costs	.0895
Fixed charges, excluding interest	.5568
Total of above	5.7302
Credit for receipts from by-products	.3042
Net cost f.o.b. mill, excluding interest	5.4260
Investment cost on basis of 6% invested capital†	.9188
Net cost f.o.b. mill, including above investment	6.3448
Investment cost on basis of interest actually paid, plus 6% on owner's equity‡	.9720
Marketing cost, including transportation§	.7652
Net cost, including marketing and investment	7.1100
Receipts from sale of sugar	6.5689
Profit or loss f.o.b. mill basis (investment and marketing costs deducted)	.5411
Total production of crop (long tons)	615,936
Number of factories covered by above cost data	69
Per cent of total production covered by above cost data	89

* Includes cost of company-grown beets, expenditures for purchased beets, expenses of transporting beets to factory, etc.

† Includes borrowed capital and owners' equity.

‡ After adjustments for miscellaneous income and expenses due to collateral operations not directly connected with sugar production have been made, such as interest and rents received wherever such adjustments are required to place mills on comparable basis.

§ Marketing cost calculated on basis of number of pounds sold, not on production.

COST OF REFINING CANE SUGAR IN THE UNITED STATES—IN CENTS PER POUND

	1922
Total refining expense, excluding loss of sugar in refining	0.669
Loss of raws in refining	.311
Total cost of refining, f.o.b. refinery, excluding interest on investment	.980
Interest on investment	.137
Total cost of refining, including interest on investment	1.117
Marketing costs	.128
Total cost of refining and marketing, including interest on investment	1.245
Number of refineries covered by above cost data	20
Per cent of total refining capacity of United States covered by above refining cost data	87.9

transportation to factory, etc. For convenience in tabulation the practice of the sugar trade journals has been adopted in designating the various crops in the different regions of sugar production, such as 1916–17 Cuba, 1916–17 beet, etc., although production and competition of these regions are not concurrent in point of time, as explained above.

In each of these tables figures were given covering a series of years, but only the figures for the last year are quoted above.

After reading the above extracts from these government reports, do you feel that reliable data were offered for equalizing the cost of production between this and foreign countries?

6. German Reparations

COSTS OF PRODUCTION: WHAT IS THE INFLUENCE OF COSTS OF PRODUCTION UPON INTERNATIONAL TRADE?

In an article[1] discussing the probable course of settlements between Germany and her creditors, the argument was used that ultimately the settlement would be limited by the amount of exportable surplus which Germany was able to create in the course of international trade. This surplus would not necessarily go direct to creditor countries, but it must go either to them or to other countries where it would create credits in favor of the nations collecting reparations. In discussing the possibilities of such an export surplus being created by Germany, the writer quoted the statistics of past years to show that under past and present conditions the required volume of export surplus was not likely to be brought about; what was needed, in his opinion, was a substantial decrease in the costs of production of exportable goods in Germany as compared with costs in other countries. This argument was advanced by Professor Keynes in the following terms:

> Now, what prevents Germany from having a greater volume of exports at the present time? Is it that the export trades cannot attract more labor at the present level of remuneration? Or is it that they cannot sell an increased output at a profit unless they can first

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[1] *Economic Journal,* London, England, March, 1929, p. 1.

reduce their costs of production? The available facts seem to indicate that the first, namely, inadequate supplies of labor at the present rates of remuneration, plays little or no part, and that the second is the real explanation.

That is to say, the solution of the Transfer Problem requires a reduction of German gold-costs of production relatively to such costs elsewhere. There are three ways of bringing this about. Either German industrialists must increase their efficiency faster than industrialists elsewhere; or the rate of interest in Germany must be lower than elsewhere; or the gold-rates of efficiency-wages must be reduced compared with elsewhere. Since German industrialists are reputed to be already at a fairly high level of efficiency relatively to those of other countries, I do not know why we should assume that they will outstrip us yet further. For it is not enough that they should increase their efficiency (that they will doubtless do); they must increase it faster than others increase their efficiency. Nor is there any prospect of relatively cheap money for Germany; though there may be some future gain from a fall of German interest rates below their present high level. It follows that the Transfer Problem requires a reduction in the present gold-rates of efficiency-wages in Germany relatively to efficiency-wages elsewhere.

That is the first point to establish. The expenditure of the German people must be reduced, not only by the amount of the reparation-taxes which they must pay out of their earnings, but also by a reduction in their gold-rate of earnings below what they would otherwise be. That is to say, there are two problems, and not—as those maintain who belittle the difficulties of transfer—one problem. Indeed, a short way of putting the case is this. The Transfer Problem consists in reducing the gold-rate of efficiency-earnings of the German factors of production sufficiently to enable them to increase their exports to an adequate aggregate total; the Budgetary Problem consists in extracting out of these reduced money-earnings a sufficient amount of reparation-taxes. The Budgetary Problem depends on the wealth and prosperity of the German people; the Transfer Problem on the competitive position of her industries on the international market.[1]

The arguments here advanced rest upon the theory of international trade which makes the imports and exports of any country to depend upon the comparative advantages which that country enjoys in the production of such goods; another expression applied to this same theory is that of comparative costs. The following excerpts from standard texts illustrate how the matter is commonly regarded.

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[1] *Ibid.*, pp. 3 and 4.

A country exports the things which are low in price in its borders; these are things in which its labor is applied effectively. Put in words more often used in the literature of economics, a country tends to export those things in which it has a comparative advantage. And, conversely, a country tends to import those things which, if produced within its borders, would be high in price—those in which its labor would be applied with less effect, those in which it has a comparative disadvantage.[1]

Or, we may say that a country tends to export those products which are produced at a lower comparative cost within its borders than elsewhere and to import those which are produced at a higher comparative cost than elsewhere. This is the law of comparative cost.[2]

For example, wheat is exported steadily in large quantities from the United States.[3] The money incomes of those who produce it are high; the farmers and their hired laborers are well remembered. If the price of wheat is low in the United States, it must be because the labor of those who produce it is effective. That is, the labor is applied to advantage.[4]

It must be understood that the influence of money in international settlements forms an essential part of the foundation of this theory or argument. If between two countries, the movement of goods is all one way, country A exporting much to country B and receiving no goods in return, then country B will have to ship gold to country A in payment. The result will be to raise prices in country A, and to cause them to fall in country B, until the point is reached where some of the exports from country A to B will no longer be profitable; on the other hand, it will become profitable to ship goods from B to A.

Which goods will be shipped from each country to the other will depend upon the relative costs of different goods produced within each country. The ratios in which these goods will be exchanged between the two countries will depend upon these same relative costs within each country, and the relative price levels of goods in the two countries.

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[1] Taussig, F. W., *Principles of Economics*, p. 482.

[2] Griffin, C. E., *Principles of Foreign Trade*, p. 19.

[3] I use wheat for illustration, though the exports are now (1909) declining, and may cease in the course of a decade. The tendency to decline in these once heavy exports is commonly ascribed to the fact that we "need" the domestic product for our rapidly increasing population. This is true, as far as it goes. But the reason, why the product fails to keep its former relation to population and "need" is the increasing cost (marginal cost) of wheat; compare Book II, Chapter 13, Sec. 4, and Book V, Chapter 42. That increase in cost means, in other words, lessening effectiveness and lessening comparative advantage; hence lessening exports. The wheat of the Canadian Northwest will probably supply in the future an illustration which will continue to fit the text.

[4] Taussig, F. W., *opus cit.*, pp. 482 and 483.

Can you think of any other method by which the reparations payments can be made by Germany than that here suggested?

Do you agree that costs of production must play a part in creating the desired exportable surplus?

Could some cost of production other than wages be reduced to help the process?

VIII

COMMERCIAL AND FINANCIAL COSTS

A. SELLING AND ADMINISTRATIVE COSTS

1. Beverly Company

GROCERY WHOLESALER: HOW SHOULD A COST SYSTEM BE INSTALLED IN A WHOLESALE GROCERY FIRM?

In addition to its regular wholesale grocery business, the Beverly Company roasted coffee, packed tea, sold fresh fruits, and blended molasses. The company, which was not departmentized, desired a system of accounts which would enable it to determine the net profits made on the different classes of merchandise sold.

The Beverly Company had annual sales of about $2,500,000. All its customers were located within a radius of from 150 to 175 miles. Each customer was called upon once in two weeks by one of the company's 15 salesmen. The company paid the salesmen 30% of gross margin, after deduction of inward freight, and charged 40% of the loss from bad debts to them. From 25 to 35% of the companies sales were of merchandise sold under its private brand.

The company maintained two sets of records for the use of its seven buyers. The first set consisted of stock sheets upon which were recorded the physical quantities of merchandise in stock, and current purchases. A physical inventory was taken once a week for some items, once in two weeks for others, once a month for others, and, in some cases, only when requested by the buyers. A complete physical inventory was taken at the beginning and in the middle of each year. Ordinarily, the stock sheets for similar items were grouped; for example, the stock records for all canned goods were kept together. The buyers were expected to note on these records the purchases which they made and the dates. Occasionally, a buyer purchased merchandise without consulting the stock sheet and neglected to enter the quantity purchased on the sheet.

In addition to the stock records, the company maintained a permanent and compact summary card system of purchase records, one card for each item. Upon these cards the buyers recorded all purchases. If manufacturers were not making prompt shipments, the buyers often noted on the purchase cards the dates on which the merchandise arrived. The card system preserved the information for use during a period of several years. Upon the basis of the stock sheets and the purchase cards, the buyers decided when to reorder and what quantities to purchase.

Previous to February, 1924, the acounting system of the Beverly Company had been simple. It had consisted of one General Merchandise account which had been debited for all purchases and customers' returns, and credited for all sales and returned purchases. The gross margin at the end of the year had been computed as the difference between the total debits and the total credits. There had been separate expense acounts for Interest, Insurance, Bad Debts, Advertising, and Charity. The other expenses had been collected in a General Expense account. The accounting system, therefore, had not permitted the company to compare all individual items of expense from year to year or to ascertain profits on individual classes of merchandise, unless complete abstracts were made up. The buyers of two classes of merchandise had attempted to calculate gross margins and net profits for these classes, but, even though the buyers could determine gross sales, they could not compute the amount of returns and allowances for the class, nor allocate expenses to them accurately.

In order to provide data readily comparable by years and by classes of merchandise, the Beverly Company, in February, 1924, decided to divide purchases, inventories, and sales into 10 departments and to allocate to each department its share of all expenses. The departments were: groceries, canned goods, dried fruits, sugar, flour, molasses, tobacco, fruit, butter, and coffee. The latter department included tea and cocoa. The company paid an accountant $1,000 to install the system.

The sales for each department were obtained from the salesmen's order blanks. This work required part of the time of two clerks each morning. Returns and allowances made to customers were determined from special blanks. Purchases, and returns allowed to the company by manufacturers, were obtained from sellers' invoices. The amount of cash discounts taken by customers was distributed between the departments on the basis of the ratios of departmental sales to total sales. First, however, the special discounts allowed by some departments, were charged against those departments.

In addition to the 10 direct selling departments, there were 12 indirect or service department accounts: Administration, Office, General, Warehouse, Receiving, Garage, Shipping, City Delivery, Advertising, Traveling Expense, General Selling, Salesmen's Commissions, and Interest. Each item of expense was analyzed and allocated, on a selected basis, to the direct and indirect departments. The totals of the indirect departments or accounts then were distributed to the selling departments, which, being the income-producing departments, ultimately had to bear all the expenses of the business. In the primary distributions, such items as rent, taxes, property insurance, employees' compensation insurance, group life insurance, depreciation, and freight out were charged almost entirely to the selling departments; other items of expense were charged mainly to the service department accounts at the first distribution, and then were distributed to the selling departments. Part or all of three indirect accounts, Administrative, General Warehouse, and Garage, was divided among other indirect accounts before being distributed to the selling departments. The distribution of one month's expenses is shown in Table 1.

In the case of rent, the company, which rented its entire building space, determined that each square foot of floor space cost annually $0.1234 and made an allocation to each department on the basis of the space usually devoted to that department. The company decided that the space of the various floors was of equal value.

Property insurance and taxes were distributed on the basis of average annual departmental inventories. Compensation insurance and group life insurance were distributed according to the proportion of payroll charged to each department. The depreciation on furniture and fixtures, calculated at 5% per annum, was charged to the Office account. The depreciation on motor trucks and automobiles, calculated at 20% per annum, was distributed to the selling departments on a basis of sales. Some depreciation also was charged to the Indirect accounts of Administration, City Delivery, and General Selling.

Some portions of the charges for salaries and payroll were divided among seven of the indirect accounts—Administration, Office, General Warehouse, Receiving, City Delivery, General Selling, and Shipping—and others were charged directly to selling departments. Executive salaries were charged directly to selling departments or to indirect accounts for redistribution, according to the manner in which each executive divided his time between direct departmental and general administrative work. Payroll was charged on the basis of a time study which had been made on payroll employees' activities.

The amount of outward freight incurred by each selling department was recorded by the delivery man who took the merchandise to the freight office, and was charged directly against the department.

Office expense, including all light and heat, was distributed to selling departments on a basis of the proportion which the items shipped from each department bore to the total number of items shipped. The number of items shipped each day and their distribution among departments were determined by the two clerks who distributed the sales each morning. The receiving expense was distributed among the departments in the proportion that the items received by each department bore to the total number of items received during the month. As handling expenses for some items were larger than for others, adjustments were made to allow for the differences. Shipping expense was distributed to selling departments on a basis of the proportion which the items shipped from the department bore to the total number shipped. Here, again, adjustments were made for differences between items in handling charges involved in shipment. For example, when shipping expense was to be allocated, the number of bags or barrels of flour shipped was multiplied by three, the number of items of coffee, by one-half, and the

TABLE I

MONTHLY DISTRIBUTION OF EXPENSES TO DEPERTMENTS OF BEVERLY COMPANY

(*Total expense for this month was* $20,663.31)

INDIRECT ACCOUNTS

Item	Administration	Office	General Warehouse	Receiving	Garage	Shipping	City Delivery	Advertising	Traveling Expense	Selling, General	Salesmen's Commission	Interest
Rent		$ 19.38			$ 93.92	$ 47.39						
Taxes												
Insurance	$ 16.90	3.67					$ 21.00			$ 15.40		
Compensation and Group Insurance	.62	10.99	$ 2.18	$ 3.34		9.72	3.79			4.05		
Depreciation	26.67	52.41					95.74			52.13		
Bad Debts										600.00		
Salaries	493.50	636.25		400.00		400.00				98.75		
Direct Expense	37.35	393.87		76.20	32.36	131.43	177.37			56.00		
Payroll		1,618.00	232.00	356.00		958.66	284.00					
Charity		17.00										
Administrative			57.50							517.54		
General Warehouse				30.91		80.50	26.60					
Garage							*151.62					
Advertising								$532.91		83.50		
Traveling Expense									$323.27	144.95		
Salesmen's Commission											$3,824.36	
Interest (actual amount paid)												$857.93
Total	$575.04	$2,751.57	$291.68	$866.45	$126.28	$1,627.70	$760.12	$532.91	$323.27	$1,572.32	$3,824.36	$857.93

* Adjusted for ledger account.

METHOD OF DISTRIBUTION:

Administration.—10% to General Warehouse; 90% to General Selling.
Office.—On a basis of items shipped from each department.
General Warehouse.—On a basis of the amount of payroll charged each department.
Receiving.—On a basis of items received in each department.
Garage.—50% to City Delivery; 50% to Fruit Department.
Shipping.—On a basis of items shipped from each department.

METHOD OF DISTRIBUTION:

City Delivery.—On a basis of items shipped in city.
Advertising.—Directly to departments that benefit, on an estimated percentage.
Traveling Expense.—Directly to departments or General Selling.
Selling General.—Dollars of departmental sales.
Salesmen's Commissions.—Basis of gross margins of the different departments.
Interest.—In inverse proportion to rate of stock-turn in departments.

TABLE 1—(*Continued*)

MONTHLY DISTRIBUTION OF EXPENSES TO DEPARTMENTS OF BEVERLY COMPANY

(*Total expense for this month was $20,663.31*)

DIRECT SELLING DEPARTMENTS

Expenses Distributed Directly to Departments	Groceries	Canned Goods	Dried Fruit	Sugar	Flour	Coffee	Molasses	Tobacco	Fruit	Butter	Total
Rent	$ 300.97	$ 162.91	$ 30.23	$ 15.11	$ 35.00	$ 89.68	$ 237.36	$ 30.23	$ 137.81	....	$ 1,039.30
Taxes	160.45	251.85	16.39	9.48	16.39	82.80	103.50	61.24	51.75	$ 2.15	756.00
Property Insurance	37.35	58.64	3.81	2.21	3.82	19.28	29.66	15.71	40.30	4.75	215.53
Compensation and Group Insurance	243.87	.90	....	1.15	....	4.55	3.67	3.57	10.84	5.25	273.80
Depreciation	....	....	....	....	....	12.50	4.17	2.50	123.23	9.75	152.15
Direct Expense	....	....	....	25.00	....	76.83	5.00	70.03	174.31	....	351.17
Payroll	97.40	136.17	5.42	134.78	14.27	623.16	402.24	406.56	1,470.00	104.00	3,394.00
Salaries	....	226.25	16.25	24.38	59.16	161.25	129.50	83.33	125.00	....	825.12
Freight Out	267.06	197.49	19.26	22.19	31.26	72.86	123.39	13.05	41.46	29.08	817.10
Garage	....	....	....	....	....	....	....	....	63.14	....	63.14
Expenses Distributed from Indirect Accounts											
Office	807.53	293.97	39.67	89.90	34.81	183.79	29.97	582.98	652.08	36.87	2,751.57
General Warehouse	9.63	12.25	.58	12.25	1.46	47.55	35.88	35.00	*	*	154.60†
Receiving	341.66	185.53	38.32	30.78	246.57	20.52	.23	2.84	*	*	866.45
Shipping	650.50	268.00	36.17	81.33	95.20	251.30	68.20	177.00	*	*	1,627.70
City Delivery	149.38	74.97	7.62	30.02	50.46	81.13	15.08	84.68	*	*	493.34†
Advertising	88.68	177.37	....	....	....	183.36	....	....	....	....	449.41
Traveling Expense	7.30	10.43	....	....	....	22.13	41.60	....	57.48	39.38	178.32
General Selling	338.98	177.18	26.15	120.17	71.70	156.35	75.67	306.54	238.47	61.11	1,572.32
Salesmen's Commission	920.82	568.78	90.42	206.24	163.40	482.86	280.43	524.30	533.76	53.35	3,824.36
Interest	71.29	159.79	85.22	14.65	39.62	99.87	307.26	35.62	19.64	24.97	857.93
Total	$4,492.87	$2,962.48	$415.51	$819.64	$863.12	$2,671.77	$1,892.81	$2,435.18	$3,739.27	$370.66	$20,663.31

* These departments had their own superintendent, and so forth, hence these items are charged above.
† Adjusted for ledger account.

number of items of molasses by two and one-half. The number of items of tobacco, on the other hand, was divided by three. The numbers of items shipped of canned goods, dried fruits, sugar, fruits, and butter were not altered.

The city delivery expense, which was the expense incurred in delivering merchandise to local grocery stores, was distributed to the selling departments, with the exception of the fruit and butter departments, on a basis of the number of items shipped as adjusted for the allocation of shipping expense. As the fruit and butter departments had their own local delivery equipment, no allocation of the general city delivery expense was made to them.

As the largest part of the newspaper advertising expense was incurred in advertising the company's private brand, which was placed, for the most part, on canned goods, coffee, tea, and cocoa, the canned goods department was charged with about 40% of the newspaper advertising expense, the coffee, tea, and cocoa department with about 40%, and the grocery department with the remainder. All expense for advertising other than newspaper advertising was charged to general selling.

Any traveling expense incurred by a selling department was charged directly to the department if possible, and, if not, to general selling. General selling expense was distributed to the departments on a basis of the proportion of each department's sales to the total sales of the company.

The company did not charge salesmen's commissions at once to the selling departments in which they were earned. Instead, it found the ratios existing between the departmental gross margins used in calculations of salesmen's commissions and the gross margin of the company as a whole, and distributed salesmen's commissions to the departments in accordance with these ratios. For example, if the amount of gross margin of the grocery department were found to be 22% of the total amount of gross margin of the company, the grocery department was charged with 22% of the total salesmen's commissions.

The company did not believe that interest on owned capital should be charged as an expense. Total interest payments made for borrowed capital were distributed to departments in inverse proportion to their rates of stock-turn; that is, a department with a stock-turn of eight was charged one-half as much interest as was a department with a stock-turn of four. The company recognized that this distribution would not be equitable if a department with an extraordinarily low inventory received an exceptionally low stock-turn. No such situation existed, however, among the departments of the Beverly Company.

To enable the company to make comparisons between the selling departments from month to month, total expense was distributed to them monthly. As the cost of determining the actual values of inventories monthly would have been excessive, their values were estimated as follows:

Table 2

Gross Margins for Estimating Monthly Inventories: Actual and Estimated Gross Margins Used by Beverly Company for Estimating Monthly Departmental Inventories, 1924 and 1925

Item	Percentages of Gross Margin Estimated for 1924	Percentages of Gross Margin Actually Received	Percentages of Gross Margin to be Used in 1925
Groceries	12	14.24	13
Canned Goods	16	17.13	16
Dried Fruits*	18.25	18.26	
Sugar*	4.34	4.34	
Flour*	12	12	
Coffee, Tea, and Cocoa	26	27.26	22
Molasses	30	34.70	30
Tobacco	9.5	8.59	9.5
Fruit	15	10.09	14
Butter*	1.57	1.58	

* Actual value of monthly inventories to be determined in these departments.

The executives of each selling department made a conservative estimate of the average gross margin which they expected their department to earn during the year. To the value of the departmental inventory at the beginning of the month was added the cost value of purchases made during the month. From this sum, gross sales minus an amount of gross margin computed at the estimated rate were subtracted. The resulting figure was taken as the value of the department's inventory at the end of the month. At the end of 1924, the company had an estimated inventory of $474,000 and an actual inventory of $457,000. The estimated percentages of gross margin used in 1924, the actual percentages of gross margin received, and the estimated gross margins to be used through 1925 were as listed in Table 2.

The net profit for each department in 1924 and the net profit for the company as a whole were as shown in Table 3.

The records for 1924 showed that the Beverly Company in that year had lost money in four departments: sugar, tobacco, fruit, and butter. The net profit of the company as a whole had equaled 1.19% of net sales, computed without deduction of interest on owned capital. The monthly statements showed that the loss in the butter department had increased steadily from the first of the year. The vice president of the company decided that the gross margin received from the sale of butter was not sufficient to cover costs. He decided, therefore, to discontinue active solicitation of sales in the butter department, and to make only such sales as came without solicitation.

It was the opinion of the vice-president that the gross margin received in the fruit department was not so great as it should be. He believed that the loss in the department had been incurred because of poor management. An example of the poor management was the large amount of spoiled fruit which it had been necessary to throw away each day. He decided, therefore, to change the management of the fruit department entirely. The vice-president believed that the losses in the tobacco department could be reduced, if not eliminated, by a change in the sales force. This change was made.

The stock-turn of the Beverly Company as a whole had been 4.3 times in 1924. The vice-president believed that this rate was too low and that efforts should be made to increase it.

It was customary for the salesmen of the company to sell as large a proportion as possible of dried fruits, which included prunes, peaches, raisins, and apricots, in advance of their deliveries. The company purchased in advance of the drying season, or during it, sufficient quantities of dried fruits to meet sales in the heavy selling period of the late fall and early winter. In 1924, however, the buyer had over-estimated the sales and had purchased a six months' supply.

TABLE 3

DEPARTMENTAL PROFIT AND LOSS STATEMENT

NET SALES, EXPENSES, GROSS MARGINS, AND NET PROFITS IN DEPARTMENTS OF BEVERLY COMPANY, 1924

	Groceries	Canned Goods	Dried Fruits	Sugar	Flour	Coffee, Tea, and Cocoa	Molasses	Tobacco	Fruit	Butter	Total
Gross Sales	$534,987	$373,649	$44,807	$146,079	$110,774	$200,145	$ 99,247	$387,437	$427,274	$158,691	$2,483,090
Returns	13,594	5,657	810	504	2,213	1,813	551	3,639	6,370	2,123	37,274
Discounts	6,843	4,873	588	1,905	....	2,587	1,311	4,944	2,841	....	25,892
Allowances	705	270	6	11	18	135	37	8,617	1,073	61	10,933
Total	$ 21,142	$ 10,800	$ 1,404	$ 2,420	$ 2,231	$ 4,535	$ 1,899	$ 17,200	$ 10,284	$ 2,184	$ 74,099
Net Sales	513,845	362,849	43,403	143,659	108,543	195,610	97,348	370,237	416,990	156,507	2,408,991
Inventory	91,788	150,894	10,124	3,774	10,052	50,510	103,874	31,547	44,485	3,698	500,746
Purchases less Discount	440,676	316,638	33,975	133,190	87,646	134,221	11,417	339,147	319,882	147,419	1,964,211
Inward Freight	8,201	15,905	3,854	3,222	2,991	4,013	5,615	181	27,460	3,785	75,227
Total	$540,665	$483,437	$47,953	$140,186	$100,689	$188,744	$120,906	$370,875	$391.827	$154,902	$2,540,184
Less Inventory	100,000	182,745	12,477	2,769	5,167	46,458	57,333	32,451	16,900	863	457.163
Cost of Sales	$440,665	$300,692	$35.476	$137,417	$ 95,522	$142,286	$ 63,573	$338.424	$374,927	$154.039	$2,083,021
Gross Margin	73,180	62,157	7,927	6,242	13,021	53,324	33,775	31,813	42,063	2,468	325.970
Net Expense	63,598	46,433	5,732	9,865	10,465	32,874	21,221	34,028	63,634	9.473	297.323
Net Profit	$ 9,582	$ 15,724	$ 2,195	$ 3,623*	$ 2,556	$ 20,450	$ 12,554	$ 2,215*	$ 21.571*	$ 7.005*	$ 28,647
Percentage of Gross Margin	14.24	17.13	18.26	4.34	12.00	27.26	34.70	8.59	10.09	1.58	13.53
Total Expense	12.38	12.80	13.20	6.86	9.64	16.81	21.80	9.19	15.26	6.05	12.34
Net Profit†	1.86	4.33	5.06	2.52*	2.36	10.45	12.90	.60*	5.17*	4.47*	1.19
Stock-turn (times a year)	4.6	1.8	3.1	42.0	12.6	2.9	.8	10.6	12.2	67.5	4.3

* Loss.

† Interest on owned capital not calculated by company.

It was the opinion of the vice-president that the production of dried fruits was greater than the demand and that consequently price changes throughout the year would tend to be downward. For this reason he desired a rapid stock-turn in that department. He intended to have a careful study made of the company's sales of dried fruits during the fall of 1925 and to have purchases for the department limited to from ten weeks' to three months' supply.

The officials of the Beverly Company were satisfied with the results obtained from departmentizing the purchases, sales, and expenses of merchandise. The departmentization had given them information which they believed would enable them to increase the net profits of the company in 1925. The cost of obtaining the additional information had not exceeded $800.

Comment critically upon the accounting procedure followed by the Beverly Company. What modifications and changes, if any, do you suggest?

Do you agree with the company's policy in regard to interest on its own capital?

What fundamental consideration must be borne in mind before cost figures are allowed to influence a company's selling and administrative policies?

2. Morgenthan Musical Instruments Company

WAREHOUSING COSTS: HOW MAY WAREHOUSING COSTS AFFECT A COMPANY'S MANUFACTURING SCHEDULE AND DISTRIBUTION METHODS?

The management of the Morgenthan Musical Instruments Company was greatly concerned about the fact that its distribution costs had for some time been increasing much faster than had production costs. The company sold its products, chiefly band instruments, direct to both retailers and jobbers; during the period between 1920 and 1929 the number of the latter had been steadily increased from two to nine. Distribution costs, in the aggregate, had always been higher than manufacturing costs, but when the definite upward tendency of the former became clearly evident, the management felt that the matter required serious consideration. Special attention was given immediately to that part of the business handled by the jobbers. While the management had no fixed convictions on that subject, and certainly had no animosities towards the jobbers, it was felt that there lay the source of the difficulties because of the huge volume of business done through this channel and the large amounts paid to jobbers in commissions.

When the company originally set the rates of commission to jobbers, it believed that the jobbers would volunteer to stock the Mongenthan instruments. This would bring about for the company not only a substantial reduction in warehousing expenses, but also, if the jobbers could be induced to stock up early, a more satisfactory production schedule.

It was found, however, that the jobbers tended more and more to place orders with the Mongenthan organization only as sales were made to the retailers, thus avoiding all handling and warehousing charges. When, moreover, the Morgenthan Company suggested that they assume the responsibility of warehousing the products, the jobbers merely replied that their commissions were insufficient to cover the costs of so doing and still leave them a profit. This brought up the whole question of warehousing costs and of selling through jobbers. The management of the Morgenthan Company had decided to make a study of this matter but was not certain as to what procedure to follow; in particular, they wondered whether to make an independent study, confining themselves to their own sources of information, or whether to approach the jobbers and frankly request their cooperation in this study which, it was thought, was for the mutual benefit of both.

What procedure should the Morgenthan executives follow?
What information on selling costs should the company obtain?
Would manufacturing costs have a bearing on this question?

3. Jorgensen Engineering Company

SALES BONUSES: ARE BONUSES TO SALES EXECUTIVES LIKELY TO CONTRIBUTE TO A MORE PROFITABLE DISTRIBUTION OF ENGINEERING AND EQUIPMENT PRODUCTS?

The Jorgensen Engineering Company made a varied line of machinery, equipment, and builders' hardware; some of its products were sold direct to manufacturing plants, and others to jobbers and retailers, and thence to the general public. The company paid all its salesmen on a straight-salary basis, with no commissions, but in considering various means of promoting the better distribution of the products, had given consideration to a plan by which sales executives were to be remunerated in large part by a bonus which was to be computed on a basis supposed to show the relative profitableness of their sales to the company. This profitableness was, however, not to be determined by the gross margin alone on goods sold; although that matter was considered and was given a certain weighting by means of a numerical factor. Other factors which were given a weighting were the relative sales expenses incurred in making the sales, the inventories on which the executive was able to operate, and the desirability of the business from a manufacturing standpoint. For sales expenses a standard budget or quota would be fixed at the beginning of the season, expressed as a percentage of sales, different rates being contemplated for different products and also for different districts, according to experience with both; a certain number of points would be given for every 1% by which any sales executive might operate his department or branch below the standard expense allowance. With regard to the manufacturing situation the matter was more complex; the costs of production for the various products, as computed for the quantities made and for the existing circumstances of production, were important, and were given some weight in connection with their influence in determining gross profit; but the company was constantly looking out for ways of improving its products, its manufacturing methods, and its profits. A major problem in this direction was the great variety of products, and the obstacle they presented to mass production on an economical competitive basis; it was hoped that certain lines might be developed to the point where the volume would justify highly specialized machinery and greater division of labor, akin to the mass production methods of the automobile industry. As yet no definite conclusions could be drawn as to which lines would be most likely to develop in this way, but it was possible to pick out certain leaders, and to note other lines as being candidates for being dropped from the list. In connection with purely manufacturing considerations, a policy of preferred sizes or lines was being developed; if, for a certain type of machine, for example, sizes progressed by very minute fractions, there was a growing tendency to adopt a scheme of minimum differences, and to eliminate intermediate sizes which were only fractionally larger than the size below or smaller than the size above. The engineering department decided, as a result of careful studies, that they could supply technical data to salesmen which would enable the latter to convince customers that these intermediate sizes were not necessary, and the lower prices which could be offered on the lines of concentration would constitute an additional incentive to customers to accept them. The bonus to sales executives offered a further opportunity to bring pressure to bear for this purpose; preferred lines were given a high rating, and others were weighted in proportion to the engineering department's opinion as to the prospects of further developing the volume and the processes of manufacturing them.

All the ratings which have been enumerated would, it was expected, be maintained unaltered for some time after being set; while they would naturally be subject to change as conditions required, yet it was hoped to give them a character of some stability. The scheme was, however, flexible enough to permit the addition of other factors which would meet temporary conditions if necessary; it might be that certain manufacturing facilities were for a time insufficiently occupied, resulting in idle capacity; a special rating might be attached to products which were made in that department, with a view to bringing pressure to bear to increase their sales. Such special ratings would be marked as subject to withdrawal, so that no misunderstanding would arise if they were subsequently canceled.

Would the cost and engineering data, as suggested, furnish a sufficiently reliable base for bonus payments to sales executives?

Would it be reasonable to apply an incentive plan to sales executives, but not to salesmen?

Do you see any elements of weakness in the plan?

4. Drake Specialty Store

EXPENSE BUDGET: ON WHAT BASIS SHOULD A RETAILING ESTABLISHMENT BUILD UP ITS EXPENSE BUDGET?

In April, 1922, the president of the Drake Specialty Store directed the controller to prepare a report recommending a general plan for controlling expenses through budgets. The controller's general recommendations were as follows:

> An expense committee should be appointed consisting of the general manager, the merchandise manager, the store superintendent, the personnel manager, and the controller. The first duty of this committee should be to divide the store's total expense budget into controllable sections and in each case to make some one executive definitely responsible for keeping the expenditures in his section within the budget.[1] The committee should not attempt to hold an executive responsible for expenditures not definitely under his control. For instance, the head of a selling department should not be made responsible for general administrative expenses prorated to his department.
>
> It is recommended that the starting point in preparing a budget be planned sales, and that the merchandise manager be requested to forward to the expense committee, 60 days before the beginning of each season, his sales estimates for the season by departments after they have been approved by the general manager. The committee, working from these planned sales figures, should develop expense budgets for each selling department and also for each non-selling department. Budgets for the selling department and non-selling departments should then be combined to form the total store budget. In case the total planned expense for the season is then found to be larger than desired, the committee should go over the estimates for the selling and non-selling departments and cut them down wherever possible in order to achieve the figure desired.
>
> After the budget has been approved, the individual budgets for the various selling and non-selling departments should be turned over to

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[1] In addition to the buyers and their assistants who were in charge of the actual buying and selling operations in each department, the Drake Specialty Store had the following executives: president, treasurer, general manager, merchandise manager, controller, store superintendent, personnel director, advertising manager, credit manager, delivery superintendent, superintendent of receiving and marking, superintendent of alteration and manufacturing operations, and office manager.

the respective managers of those departments as their "open-to-spend" limits, and throughout the year actual expenditures should be carefully compared with estimated expenditures. The head of each controllable section should be responsible for seeing that the departments within his section do not exceed estimates without valid reason.

In planning expenses it is recommended that the president of the store set up a goal from which the expense committee should work. It is further recommended that this goal be one difficult to attain. Our expense percentage last year was 29%. The goal for the fall season of 1922 might well be set at 25 or 26%. To reach that amount important reductions would have to be effected in many departments, and in order to make these reductions the committee would have to do a large amount of studying and analyzing. In fact, the policy of setting up a difficult goal might lead to careful job analyses, the introduction of scientific methods, and material reductions in expense. It is recommended that the budget figures be not incorporated in the actual accounts but be carried as statistical figures which may be compared at frequent intervals with actual figures taken from the accounts. It is not recommended that these innovations be adopted at once, but rather that the committee work into them gradually.

Since it was the committee's recommendation that planned sales be used as a basis in developing expense budgets, the president directed the merchandise manager to investigate the possibilities of developing a more exact method of planning sales in the Drake Specialty Store.[1] Formerly it had been the practice in the Drake Specialty Store to plan sales for the store as a whole and for each department by months for a season in advance. These estimates were made roughly by the merchandise manager in conference with the department buyers, and usually they were ready for presentation to the general manager a month or six weeks before the opening of the new season. In his conferences with the buyers the merchandise manager had attempted to arrive at sales estimates that would reflect the normal growth of the store, the purchasing power of the store's customers as compared with the corresponding season of the preceding year, general economic conditions, the share of the community's business that the Drake Specialty Store desired to get, style conditions in the merchandise in individual departments, and the rate of stock-turn and expense percentages in the Drake Store as compared with those in similar stores elsewhere. On the basis of these considerations the merchandise manager had increased or decreased his estimates from the sales actually made by each department in the corresponding season of the preceding year. No attempt, however, had been made to compute the amount of increase or decrease mathematically. Rather, the merchandise manager had considered the various factors affecting each department and had then decided that for the coming season its sales would be greater or less than in the preceding season by a certain percentage.

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[1] Some controllers favor using planned expenses as a basis for planning sales rather than using planned sales as a basis for planning expenses. The following is an excerpt from an article written by the controller of a Chicago department store on this subject:

"The use of the expense basis necessitates a careful budgeting in advance of departmental expenses, both direct and indirect. In a going business with adequate records of past sales and expenses, it is possible to determine for a given period in advance approximately the amount of total expense in dollars and cents for each department. Suppose that for a given department for six months the estimated expense is $30,000, and the expected gross profit is 33⅓%. This means that a volume of sales of $90,000 would exactly cover the estimated expenses but would leave no net profit. On the assumption that the store desires this department to show a net profit of 10% on cost of merchandise sold, the procedure is as follows:

"Selling price, 100%, minus gross profit, 33⅓%, leaves cost of merchandise sold, 66⅔%. Since 10% profit on cost is desired, 1/10 of 66⅔% or 6⅔% is subtracted from the gross profit, 33⅓% leaving a figure of 26⅔%. This figure is obviously the necessary expense percentage of the department if a net profit of 10% on cost is to be realized. The estimated expense of the department in dollars and cents, $30,000, divided by 26⅔%, the necessary expense percentage gives a result in round numbers of $112,500. This sum is the volume of sales necessary to secure the desired results in this department. The proof is as follows:

"Thirty-three and one-third per cent of $112,500 equals $37,500, the gross profit. This amount, $47,500, minus $30,000 equals $7,500 net profit. Net sales, $112,500, minus $37,500 gross profit equals $75,000, cost of merchandise sold. Net profit $7,500, is 10% of $75,000, cost of merchandise sold.

The Drake Specialty Store operated on the retail method of inventory and used the classification of accounts recommended by the Controllers' Congress of the National Retail Dry Goods Association; it belonged to an association of similar stores organized for the purpose of comparing operating figures. About 250 persons were employed, half of them being classed as non-selling employees. The store had net sales of slightly over $3,000,000 a year. Its 33 departments included women's suits, waists, coats, costumes, furs, skirts, millinery, neckwear, gloves, jewelry, and various complementary departments selling ready-to-wear articles for women, misses, children, and infants.

The petticoat department was fairly typical of most of this store's ready-to-wear departments. In this department, however, the collections of statistical information had been carried to greater lengths than in most of the other departments of the store. Its merchandise was divided into the following classifications: evening, jersey, satin, taffeta, jersey top, knickers, and extra size. The following statistics were available in this department for each season:

Gross sales in pieces and in dollars by merchandise classifications.
Purchases in pieces and in dollars cost and retail by merchandise classifications.
Stocks in pieces and in dollars cost and retail at the end of each month by merchandise classification.
Mark-downs at retail in dollars.
Returns and allowances at retail in dollars.
Price range by merchandise classifications.
Rate of stock-turn.
Maintained gross margin in dollars.
Direct expense in dollars under the following classifications:

Advertising
Buying salaries
Traveling expenses of buyers
Selling salaries
Bonuses
Other department salaries

Prorated expense in dollars under the following classifications:

Administrative and general
Occupancy
Publicity
Buying
Selling
Delivery

Should the store have used planned sales as a starting point in budgeting expenses? If not, what should have been the starting point?

Should the general method have been to work from sales to expenses and stocks, or from expenses and stocks to sales?

In budgeting expenses, should the store have proceeded by setting up an arbitrary expense percentage to be reached if possible, or should it first have undertaken job analyses to determine reasonable minima for the various items of expense?

Should the budget figures have been set up in the actual accounts and adjusted from time to time?

B. COST ACCOUNTING IN BANKS

1. Alford Commercial Bank[1]

INDUSTRIAL LOAN DEPARTMENT: CAN INFORMATION SHOWING THE INTERRELATION OF DIFFERENT ECONOMIC FACTORS PRESENT IN THE OPERATIONS OF AN INDUSTRIAL CONCERN BE PRESENTED INTELLIGENTLY IN CHART FORM?

The vice-president in charge of industrial loans at the Alford Commercial Bank found, in dealing with his clients, that a large number of them did not have a clear idea of the economic relations existing between the various factors entering into the operation of a company. He was, therefore, interested in obtaining a means of showing clearly and simply the interrelation of such factors and the effect that the installation of various policies might be expected to have upon the final profits and stability of their businesses.

In the course of his reading, the executive came across the chart shown on the next page, which seemed to him could be used in illustrating the relation of some of the economic forces dealt with in the operation of an industrial concern.

The chart had been developed to show the results of a study made by a number of business executives and represented the characteristic conditions found in industrial work. The "Cost of Production" line, as shown, was made up of two factors, the first, "A," representing the fixed charges carried by a company, and the second, "B," the expenses which varied with the amount of production. The line representing the value of the output starting at zero for no production crossed the "Cost of Production" line at the critical point "*e*" and continued above it. For any amount of production up to the point "*e*" a company was operated at a loss. At that point the income just balanced the costs and no profit was made, but beyond that point a comparatively small increase in production resulted in a large increase in net profits.

The scale of production shown in effective working days per month brought out the fact that the average concern had to work slightly more than 20 days per month before any profit could be made and that with an average of 25 working days, all the profit could be considered to have been made in the last 5 days. Further, if it were possible to work 30 days in the month, it was shown that the actual profit would be doubled while production would only be increased 20%. The writer of the article, therefore, maintained that the logical way to increase industrial profits was to increase production and contended that the reduction of material and labor costs which might be made were relatively unimportant in comparison with the other factor.

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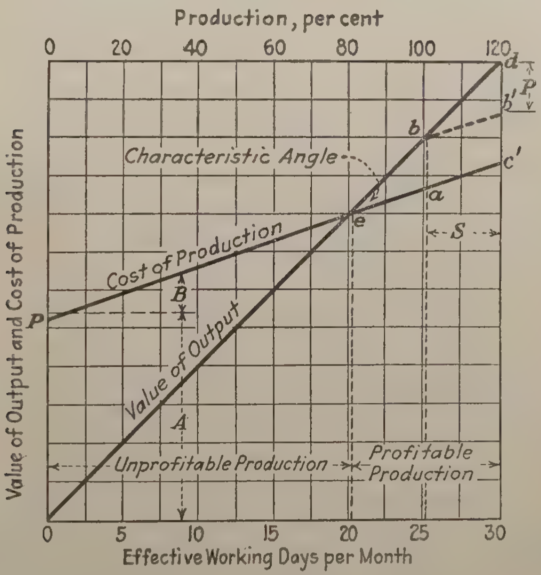
[1] Adapted from "On Which Day Do Your Profits Begin?" by A. J. T. Taylor, *Business*, March, 1929, p. 143.



Ratio $\frac{P}{S}=K$

CHART 1.

The rate at which profits would accrue after passing the critical point "*e*" depended on the size of the characteristic angle "*aeb*," which it had been found tended to remain constant for any industry in a particular country. In this relation the investigation revealed the fact that 60% of the increase in the value of the production beyond the critical point in the mechanical pulp industry became net profits while for other industries the following figures were determined.

	Percent
Cellulose industry	45
Textile industry	43
Chemical industry	42
Fine Paper industry	40

The vice-president felt that the chart illustrated clearly some of the points which he often wished to emphasize in his conferences with clients, but he also felt that the chart, although based on facts, was somewhat too theoretical for use with specific companies. He therefore instructed his assistant to study the illustration, criticize it and improve upon it if possible, and then draw up typical charts for them, and on the basis of the characteristic situation shown, comment on the emphasis which should be applied to the different lines of endeavor with regard to the following industries:

Cement industry
Boot and Shoe industry
Paper industry
Textile industry
Motor Vehicle industry

How would you as the vice-president's assistant go about the task assigned?

2. Weimar Bank and Trust Company

OPERATING STATEMENT: WHAT ARRANGEMENT OF INCOME AND EXPENSE ITEMS WILL GIVE THE BEST PICTURE OF THE OPERATIONS OF A BANK?

The officers of the Weimar Bank and Trust Company, which was situated in a small New England town, had always prepared the bank's operating statement in the form used by the Federal Reserve Bank of Boston[1] in its compilation of statistics of operating income and expense. The 1928 statement, so prepared, was as shown in Form 1.

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[1] See case of that name, page 670.

WEIMAR BANK AND TRUST COMPANY

Operating Statement for Year Ending November 30, 1928

Interest and Discount Earned	$63,842.91	
All Other Earnings	4,097.20	
Gross Earnings		$67,940.11
Less Operating Expenses:		
Salaries and Wages Paid	$19,287.50	
Interest Paid on Deposits	10,320.33	
Interest Paid on Borrowed Money	6,095.42	
Rent, Taxes, and Other Expenses	22,678.58	
Total Current Expenses		58,381.83
Net Earnings (Before Losses)		$ 9,558.28
Net Losses Charged Off		327.56
Net Earnings for Year		$ 9,230.72
Dividends Paid		5,300.00
Net Addition to Surplus		$ 3,930.72

Form 1.

When the officers saw the publications of the New York State Bankers' Association,[1] however, they observed the form there used, and the arguments advanced in favor of it. The arrangement was as shown in Form 2, for the statement of their bank.

WEIMAR BANK AND TRUST COMPANY

Operating Statement for Year Ending November 30, 1929

Interest and Discount Earned		$63,842.91
Less Interest Paid on Deposits	$10,320.33	
Interest Paid on Borrowed Money	6,095.42	16,415.75
Net Interest Earned		$47,427.16
All Other Earnings		4,097.20
Gross Earnings		$51,524.36
Less Operating Expenses:		
Salaries and Wages Paid	$19,287.50	
Rent, Taxes and Other Expenses	22,678.58	41,966.08
Net Earnings (Before Losses)		$ 9,558.28
Net Losses Charged Off		327.56
Net Earnings for Year		$ 9,230.72
Dividends Paid		5,300.00
Net Additions to Surplus		$ 3,930.72

Form 2.

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[1] *Report of Committee on Bank Costs*, presented at the Convention in Washington, D. C., June, 1927.

The reasons given for preferring this form were that the commodity handled by a bank is money, that interest earned was the income derived from the sale of money and that it was therefore desirable to show a corresponding cost of obtaining money, which was found in the items for interest paid. The figure of net interest earned was, it was thought, comparable to the gross margin earned on merchandise by a manufacturer or merchant. It was further urged that the expenses of operating a bank, such as salaries, rentals, advertising, and the like, were fundamentally different in character from interest paid.

The officers of the Weimar Bank considered these arguments, but decided to continue with their own form.

Was the comparison between net interest earned and the gross margin on merchandise a valid one?

Was the Weimar Bank and Trust Company wise in its decision to adhere to the former arrangement of its operating statement?

Was interest paid by the Weimar Bank and Trust Company of entirely different nature from other expenses?

3. TUFTON NATIONAL BANK

GENERAL OVERHEAD: SHOULD THE CHARGES TO A BANK CUSTOMER'S ACCOUNT INCLUDE ANYTHING FOR GENERAL OVERHEAD?

The Tufton National Bank was one of the larger banks in a large city. It had developed a procedure for the determination of the profitableness of individual customer's accounts, in the course of which the question arose as to whether anything should be charged to the accounts costs for the bank's general overhead. The items involved were chiefly the costs of providing and maintaining the bank's building and equipment, and the salaries of the general officers—all items, in fact, which could not be charged directly to a specific activity or account. In considering this question the officer in charge inquired what were the objects sought in making the account analyses; the reply was that it was intended to assist in the development of more profitable accounts, and to find means of converting unprofitable accounts to a more satisfactory showing; it was, however, clear in the minds of all concerned that there could be nothing hard and fast about it, and that it was extremely unlikely that a customer would ever be asked to withdraw his account. Rather would means be sought, in friendly conversation, to make the account more profitable. This being stated, it became evident that friendly relations with customers were an essential feature of the work, and that it was necessary to put up the account analysis in a way which when presented to a customer would carry the greatest conviction and give the least offence or opportunity for quibbling. The officer in charge, therefore, proposed that no charges should be made to an account which were not direct and immediate costs of handling it; this would include the costs of departments through which checks and deposits and other account items were handled, but would not include anything for general overhead.

Bank customers usually believe that their accounts are profitable to the bank, and that the bank is glad to have them. If, therefore, the Tufton National Bank should inform a customer that his account was in fact not profitable he would be incredulous, and would "wish to see the figures." His attention would soon be directed to the charges for handling his account, and, if unacquainted with such matters, he would be greatly surprised at their magnitude, and would inquire what they included. When told that such charges as maintenance of the main banking hall were made, he would say that it was not necessary for his account to be in a bank with hand-painted ceilings, and that he would take it elsewhere; similar remarks were provoked with regard to the president's salary, or to the cost of maintaining limousines for the principal bank officers. As a matter of fact, the Tufton National Bank had arrived at an unusually economical basis of operation, but these symptoms of magnificence provided a customer with excuses when the cost of his account was in question, whereas if they were not charged he could have no reasonable answer. The bank accordingly decided to prepare these analyses without general overhead being included. One officer used the argument that the items included in general overhead were of such a nature as to be properly chargeable against the gross earnings made on stockholders' friends; it was their business, he said, to provide a banking house and an organization capable of directing the activities of the bank, and it was unreasonable to charge anything for them to customers' accounts.

Were the costs of handling customers' accounts fully stated if no charge for general overhead was included?

Were all the reasons given for the exclusion of overhead charges sound?

4. Federal Reserve Bank of Boston

OPERATING COSTS: OF WHAT VALUE MAY COMPOSITE FIGURES OF COSTS AND PROFITS GATHERED BY A FEDERAL RESERVE BANK BE TO MEMBER BANKS?

From 1921 to 1926, the Federal Reserve Bank of Boston computed, from data regularly presented to the controller, statistics of costs and profits for member banks in Federal Reserve District I, and worked them up into composite percentages for publication, primarily for the use of member banks, but available to all banks. The character of a bank's operations, and especially its principal expenses for salaries and interest payments, were determined mainly by the percentage of time deposits to total deposits; a bank handling mostly commercial deposits had a greater activity per dollar, and paid more for salaries; but a bank handling mostly time deposits paid less for salaries, and very much more for interest. The first table put out by the Federal Reserve Bank of Boston was, therefore, a statement of Percentages of Operating Costs and Profits, All Member Banks Grouped According to Character of Business (Form 1).

On the same basis as to character of business done, a chart was prepared to show the percentages of the principal items of expenses to the gross income of the banks (Form 3, on p. 674).

To Form 3, the following note was appended:

> This chart shows, in terms of percentages of current expenses to gross earnings, the cost of operating banks, grouped according to their character of business. It indicates that banks having less than one-fourth of their gross deposits in the form of time deposits are the cheapest to operate, and therefore the most profitable. As soon as the ratio of time deposits to gross deposits rises appreciably above

PERCENTAGES OF OPERATING COSTS AND PROFITS IN 1926

ALL MEMBER BANKS, GROUPED ACCORDING TO CHARACTER OF BUSINESS

	Percentages of Time Deposits to Gross Deposits				
	0 (51 banks)	Under 25.1% (98 banks)	25.1%–50% (94 banks)	50.1%–75% (120 banks)	Over 75% (51 banks)
Percentages of Loans and Investments					
Interest and Discount Earned	5.4%	5.3%	5.5%	5.6%	5.6%
All Other Earnings	.3	.5	.4	.4	.4
Gross Earnings	5.7	5.8	5.9	6.0	6.0
Salaries and Wages	1.5	1.4	1.2	1.0	.7
Interest paid on Deposits	.2	1.2	2.1	2.6	3.0
Interest paid on Borrowed Money	*	.1	.1	*	*
Rent, Taxes and Other Expenses	1.7	1.2	1.0	1.1	1.0
Total Current Expenses	3.4	3.9	4.4	4.7	4.7
Net Earnings (before losses)	2.3	1.9	1.5	1.3	1.3
Net Losses Charged Off	+.1	.2	.2	*	+.1
Net Profits (after losses)	2.4	1.7	1.3	1.3	1.4
Dividends Paid	1.3	1.0	.6	.5	.5
Net Reserves and Surplus	1.1	.7	.7	.8	.9
Other Ratios:					
Current Expenses, to *Gross Earnings*	59.7	67.2	74.6	78.3	78.3
Net Earnings (before losses), to *Gross Earnings*	40.3	32.8	25.4	21.7	21.7
Net Losses Charged Off, to *Gross Earnings*	+1.8	3.4	3.4	.5	+1.3
Net Profits (after losses), to *Gross Earnings*	42.1	29.4	22.0	21.2	23.0
Salaries and Wages, to *Current Expenses*	44.1	35.9	27.3	21.3	14.9
Interest paid on Deposits, to *Current Expenses*	5.9	30.8	47.7	55.3	63.8
Interest paid on Borrowed Money, to *Current Expenses*	1.2	2.1	1.1	.8	.2
All Other Expenses, to *Current Expenses*	48.8	31.2	23.9	22.6	21.1
Interest paid on Deposits, to *Gross Deposits*	.3	1.3	2.2	2.7	3.2
Net Earnings (before losses), to *Total Available Funds* (b)	1.9	1.6	1.3	1.1	1.1
Loans charged off, to *Loans and Discounts*	0	.2	.3	.2	*
Securities charged off, to *Bonds and Stocks Owned*	0	.1	.1	.1	.1
Net Profits (after losses), to *Capital Funds* (a)	7.4	6.7	7.5	9.1	10.6
Dividends paid, to *Net Profits* (after losses)	54.0	59.0	48.0	41.0	38.0
Capital Funds (a), to *Gross Deposits*	44.0	27.0	16.0	13.0	12.0
Time Deposits, to *Gross Deposits*	0	5.0	41.0	62.0	81.0
Bonds and Stocks, to *Loans and Investments*	42.0	29.0	35.0	42.0	53.0
Loans and Investments, to *Total Available Funds* (b)	82.0	81.0	85.0	87.0	89.0

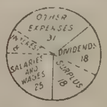
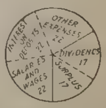
(a) Consists of Capital, Surplus, and Undivided Profits.

(b) Consists of Capital, Surplus, Undivided Profits, Gross Deposits, National Bank Notes, Bills Payable and Rediscounts. * Indicates less than .05%.

FORM I.

OPERATING COSTS AND

A Composite Picture of all Member Banks in Federal

Size: Gross Loans and Investments	Under $500,001		$500,001–$1,000,000	
Size: Typical Bank	$350,000 (51 Banks)		$750,000 (84 Banks)	
Percentages of Loans and Investments:	$	%	$	%
Interest and Discount Earned	19,600	5.6	41,250	5.5
All Other Earnings	1,400	.4	3,000	.4
Gross Earnings	21,000	6.0	44,250	5.9
Salaries and Wages	5,250	1.5	9,750	1.3
Interest paid on Deposits	1,750	.5	9,750	1.3
Interest paid on Borrowed Money	300	.1	50	*
Rent, Taxes and Other Expenses	6,000	1.7	9,700	1.3
Total Current Expenses	13,300	3.8	29,250	3.9
Net Earnings (before losses)	7,700	2.2	15,000	2.0
Net Losses Charged Off	0	0	0	0
Net Profits (after losses)	7,700	2.2	15,000	2.0
Dividends Paid	3,850	1.1	7,500	1.0
Net Reserves and Surplus	3,850	1.1	7,500	1.0
Percentages of Gross Earnings:				
Interest and Discount Earned	19,600	93.4	41,250	93.2
All Other Earnings	1,400	6.6	3,000	6.8
Gross Earnings	21,000	100.0	44,250	100.0
Salaries and Wages	5,250	25.0	9,750	22.0
Interest paid on Deposits	1,750	8.3	9,750	22.0
Interest paid on Borrowed Money	300	1.2	50	.2
Rent, Taxes and Other Expenses	6,000	28.8	9,700	22.0
Total Current Expenses	13,300	63.3	29,250	66.2
Net Earnings (before losses)	7,700	36.7	15,000	33.8
Net Losses Charged Off	0	0	0	0
Net Profits (after losses)	7,700	36.7	15,000	33.8
Dividends Paid	3,850	18.3	7,500	16.9
Net Reserves and Surplus	3,850	18.4	7,500	16.9
Disposition of the Bank Dollar *(The circle represents each dollar earned, or 100% of gross earnings)*				
Other Ratios:				
Net Profits, to *Capital Funds (a)*		6.7		7.3
Net Earnings, to *Available Funds (b)*		1.7		1.6
Loans charged off, to *Loans and Discounts*		0		0
Securities charged off, to *Bonds and Stocks*		0		0
Loans and Investments, to *Available Funds (b)*		84.0		85.0
Securities, to *Loans and Investments*		49.0		43.0
Capital Funds (*a*), to *Gross Deposits*		40.0		28.0
Interest paid on Deposits, to *Gross Deposits*		.7		1.7
Time Deposits, to *Gross Deposits*		1.0		16.0

(*a*) Consists of Capital, Surplus, and Undivided Profits.

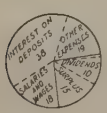
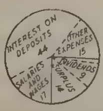
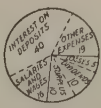
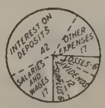
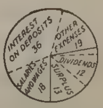
(*b*) Consists of Capital, Surplus, Undivided Profits, Gross Deposits, National Bank Notes, Bills Payable and Rediscounts.

* Indicates less than .05%.

Form 2.

PROFITS IN 1926

Reserve District I, Grouped According to Size

$1,000,001–$2,000,000 $1,500,000 (99 Banks)		$2,000,001–$5,000,000 $3,300,000 (99 Banks)		$5,000,001–$10,000,000 $7,000,000 (43 Banks)		Over $10,000,000 $18,000,000 (38 Banks)		F. R. District I Common Ratios (414 Banks)	
$	%	$	%	$	%	$	%	1926 %	1925 %
85,500	5.7	181,500	5.5	378,000	5.4	918,000	5.1	5.5	5.5
4,500	.3	13,200	.4	28,000	.4	126,000	.7	.4	.6
90,000	6.0	194,700	5.9	406,000	5.8	1,044,000	5.8	5.9	6.1
16,500	1.1	33,000	1.0	63,000	.9	180,000	1.0	1.1	1.1
34,400	2.3	85,800	2.6	161,000	2.3	432,000	2.4	2.1	2.1
500	*	1,200	*	4,000	.1	10,000	.1	*	*
16,100	1.1	28,600	.9	73,000	1.0	170,000	.9	1.1	1.1
67,500	4.5	148,600	4.5	301,000	4.3	792,000	4.4	4.3	4.3
22,500	1.5	46,100	1.4	105,000	1.5	252,000	1.4	1.6	1.8
200	*	2,300	.1	21,000	.3	67,000	.4	.1	.3
22,300	1.5	43,800	1.3	84,000	1.2	185,000	1.0	1.5	1.5
9,000	.6	19,800	.6	42,000	6	135,000	.7	.7	.7
13,300	.9	24,000	.7	42,000	.6	50,000	.3	.8	.8
85,500	95.0	181,500	93.2	378,000	93.1	918,000	87.9	93.2	90.2
4,500	5.0	13,200	6.8	28,000	6.9	126,000	12.1	6.8	9.8
90,000	100.0	194,700	100.0	406,000	100.0	1,044,000	100.0	100.0	100.0
16,500	18.3	33,000	16.9	63,000	15.5	180,000	17.2	18.6	18.0
34,400	38.3	85,800	44.1	161,000	39.7	432,000	41.4	35.6	34.4
500	.6	1,200	.6	4,000	1.0	10,000	.9	.7	.8
16,100	17.8	28,600	14.7	73,000	17.9	700,000	16.3	18.0	17.3
67,000	75.0	148,600	76.3	301,000	74.1	792,000	75.8	72.9	70.5
22,500	25.0	46,100	23.7	105,000	25.9	252,000	24.2	27.1	29.5
200	.2	2,300	1.2	21,000	5.2	67,000	6.4	1.7	4.9
22,300	24.8	43,800	22.5	84,000	20.7	185,000	17.8	25.4	24.6
9,000	10.0	19,800	10.2	42,000	10.5	135,000	12.9	11.9	11.5
13,300	14.8	24,000	12.3	42,000	10.2	50,000	4.9	13.5	13.1
									
	9.9		8.7		8.1		7.2	8.2	7.9
	1.3		1.2		1.2		1.1	1.3	
	.1		.3		.2		.4	.1	
	.1		.1		.1		.3	.1	
	86.0		86.0		85.0		84.0	85.0	
	42.0		39.0		27.0		22.0	39.0	40.0
	15.0		13.0		14.0		13.0	17.0	17.0
	2.5		2.7		2.4		2.4	2.3	2.3
	52.0		52.0		46.0		35.0	43.0	40.0

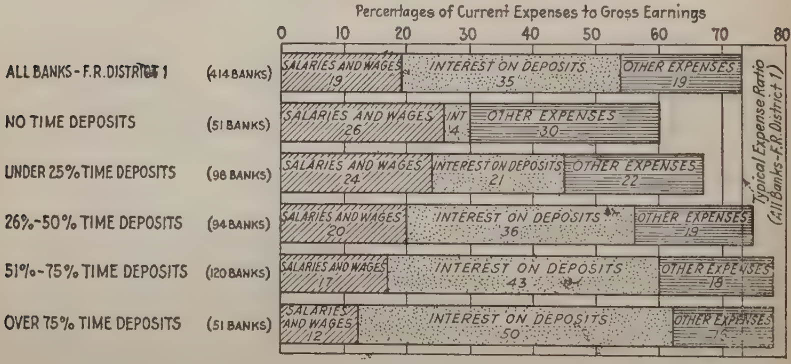
NOTE.—Statistically, these data are not arithmetical averages,—but the percentages which were found to be most nearly typical of the *greatest number* of banks. This method was used in order to avoid giving too great weight to a few extremely high or extremely low figures. The largest bank carries no greater weight than the smallest.

FORM 2.

25%, the operating costs rise above 73% of gross earnings—73% being the typical operating ratio for all banks in Federal Reserve District I during 1926.

Another important factor was the size of the bank, as indicated by the gross amount of its loans and investments. The Federal Reserve Bank of Boston, therefore, prepared also a statement of Operating Costs and Profits—A Composite Picture of All Member Banks in Federal Reserve District I, Grouped According to Size (Form 2, on preceding two pages).

CURRENT EXPENSES IN 1926
ALL MEMBER BANKS IN FEDERAL RESERVE DISTRICT I
GROUPED ACCORDING TO PROPORTION OF TIME TO GROSS DEPOSITS



FORM 3.

In 1926, the Federal Reserve Agent's Department felt that more serviceable data might be gathered by sending questionnaires, especially prepared for the purpose, directly to the member banks, rather than taking information which was not presented for this particular purpose from the controller's figures. Although this department had no authority to compel the member banks to report in this manner, it was hoped that in the course of a few years, the number reporting voluntarily would be sufficient to produce more effective figures, than those taken from all banks reporting to the controller, because of the type of information requested. Up to the present time, a steady increase has been seen in the number reporting. In 1928, 207 banks reported out of a total membership in this district of about 400.

The questionnaire sent to the member banks attempted to define exactly what was required of the bank, and to give in sufficient detail directions for filling out the forms, that all figures would be comparable. A general explanation covering the purpose and content of the questionnaire follows:

GENERAL EXPLANATION

The purpose of this reporting form is to enable banks to make an analysis of Income and Expenses for the calendar year (or for the bank year which most nearly corresponds to the calendar year). It is in four parts or schedules. To avoid confusion in referring to the various items, each item of the reporting form is given a separate number (or a combined letter and number), there being no duplication in the numbers by which the various items are designated. Entries are not necessary for the unnumbered items.

Schedule A is intended to be a complete reflection of Current Income and Current Expenses from *banking* operations; obviously the most accurate picture would be furnished if the various items could be reported on an accrual basis, but in the absence of accounts kept on that basis, cash receipts and expenditures should be entered, except as Item 34 may be in whole or in part a bookkeeping item of rental charged itself by a bank owning and occupying its own quarters.

Schedule B is *supplementary* to Schedule A, being the *detail* of Item 34 of Schedule A, (Occupancy and Maintenance of Quarters) so far as that item applies to *leased quarters only.*

Schedule C is also *supplementary* to Schedule A, being the detail of Item 34, (Occupancy and Maintenance of Quarters) so far as that item applies to *quarters owned by the bank.*

Schedule D brings together in summary form for the calendar year (or the bank year) the (*a*) Aggregate Net Current Earnings from banking and building operations; (*b*) Non-Current Income and (*c*) deductions therefrom; (*d*) Net Non-current Earnings or Net Losses; (*e*) Net Profits; (*f*) Dividends paid or accrued; and (*g*) the final Balance for Reserve or Surplus.

FORM 4

Every item in each schedule was defined in more detail, as may be seen in Schedules B and C, so that all misunderstandings on the part of the members might be avoided.

SCHEDULES B AND C

Expense of Occupancy and Maintenance of Quarters

One of the important items of expense provided for in this classification is described as "Occupancy and Maintenance of Quarters." This is intended to take the place of and to include the item of "Rent" which usually appears on Expense schedules, for the reason that in the absence of a standard definition of the

PERCENTAGES OF BANK INCOME AND EXPENSES IN 1928

NINE BOSTON BANKS AND 198 COUNTRY BANKS IN FEDERAL RESERVE DISTRICT I GROUPED ACCORDING TO THEIR PERCENTAGES OF TIME DEPOSITS

	Boston Banks	Country Banks			
Percentages of Time Deposits to Gross Deposits Typical Bank in Group	19% (9 Banks)	*under* 25.1% 6% (59 Banks)	25.1% *to* 50% 40% (51 Banks)	*over* 50% 67% (88 Banks)	Totals Common Figures (198 Banks)
Percentages of Gross Current Income from Banking operations:					
ANALYSIS OF RECEIPTS					
1. Interest and Discount on Loans	74.0%	68.1%	62.4%	56.5%	61.3%
2. Interest and Dividends on Bonds and Stocks	15.2	27.4	32.3	40.3	34.8
3. Interest on Balances in Domestic Banks	1.0	1.3	.9	.7	.9
4. All other Interest (including Balances in Foreign Banks)	.5	0	0	0	0
5. Total Interest Received	90.7	96.8	95.6	97.5	97.0
6. Trust Department	2.9	0	1.0	0	.1
7. Rent from Safe Deposit Vaults	1.5	1.4	1.2	.8	1.0
8. Service Charges on Small Deposit Accounts	1.2	.1	1.6	0	.3
9. All other Current Income	3.7	1.7	.6	1.7	1.6
10. Gross Current Income	100.00	100.0	100.0	100.0	100.0
ANALYSIS OF PAYMENTS					
11. Interest Paid on Balances Due to Domestic Banks	3.4	1.4	1.1	.3	.9
12. Interest Paid on All other Demand Deposits	22.5	13.7	11.7	5.4	10.8
13. Interest Paid on Time Deposits	11.0	4.8	25.2	42.6	28.2
14. Total Interest Paid on all Deposits	36.9	19.9	38.0	48.3	39.9
15. Interest Paid on Borrowed Money	1.7	2.1	1.7	.8	1.5
16. Total Interest Payments	38.6	22.0	39.7	49.1	41.4
17. Salaries and Wages (except for Building Maintenance)	21.8	27.0	20.0	16.6	19.8
18. Occupancy and Maintenance of Quarters	5.7	5.7	5.8	3.5	4.5
19. Taxes (except on Bank Building)	1.6	6.0	4.0	5.0	4.6
20. Insurance (except on Bank Building)	.5	.8	.7	.6	.7
21. Printing, Stationery, and Office Supplies	1.4	2.8	2.4	1.9	2.3
22. Telephone and Telegraph	.6	.4	.4	.3	.3
23. Postage and Express	.5	1.1	.7	.7	.7
24. Publicity and Expansion	1.2	1.0	1.3	1.2	1.1
25. Furnishings, Equipment and Fixtures	.5	.9	1.1	1.0	1.0
26. All other Operating Expenses	2.3	2.3	1.7	1.7	1.8
27. Total Operating Expenses	36.1	48.0	38.1	32.5	36.8
28. Total Current Expenses (Items 16 and 27)	74.7	70.0	77.8	81.6	78.2
29. Net Current Earnings from Banking Operations	25.3	30.0	22.2	18.4	21.8

Distribution of Aggregate Net Current Earnings:					
30. Net Earnings from Banking Operations	97.0	96.3	95.8	96.7	96.3
31. Net Earnings from Operation of Bank Buildings	3.0	3.7	4.2	3.3	3.7
32. Aggregate Net Current Earnings	100.0	100.0	100.0	100.0	100.0
33. Net Non-current Income (+) or net charge-offs (−)	−26.0	−.6	0	+.1	−.3
34. Net Profits (after charge-offs, etc.)	74.0	99.4	100.0	100.1	99.7
35. Dividends Paid	65.0	64.0	53.8	49.2	55.0
36. Balance for Reserves and Surplus	9.0	35.4	46.2	50.9	44.7
Interest Rates:					
37. Received on Loans and Discounts	5.1	5.7	5.7	5.9	5.8
38. Received on Bonds and Stocks	4.6	4.6	4.9	5.3	5.0
39. Received on Domestic Bank Balances	1.5	1.6	1.5	1.6	1.6
40. Paid on Balances due to Domestic Banks	2.0	1.6	1.5	1.1	1.4
41. Paid on Individual Demand Deposits	1.7	.9	1.2	.9	1.0
42. Paid on Savings Deposits	3.4	No Dept.	3.7	3.8	3.8
43. Paid on Other Time Deposits	3.2	2.4	3.8	2.3	2.5
Percentages of Loans and Investments:					
44. Interest and Discount Received	5.1	5.5	5.5	5.7	5.6
45. Interest Paid on Deposits and Borrowed Money	2.1	1.3	2.3	2.8	2.4
46. Salaries and Wages	1.2	1.5	1.2	1.0	1.1
47. Occupancy and Maintenance	.3	.3	.3	.2	.3
48. Taxes	.1	.3	.2	.3	.3
49. All Other Current Expenses	.7	.6	.5	.4	.4
50. Total Operating Expenses (except Interest Paid)	2.3	2.7	2.2	1.9	2.1
51. Net Current Earnings from banking operations	1.5	1.7	1.3	1.1	1.3
Losses (Percentages of average holdings):					
52. Loans and Discounts Charged off	.6	.2	.2	.2	.2
53. Bonds and Stocks Charged off	.8	.1	.1	.2	.2
Measure of Profit:					
54. Net Profits Available for Dividends, Earned on Total Available Funds (a)	1.0	1.5	1.0	1.0	1.1

FORM 5.

(*a*) Consists of Capital, Surplus, Undivided Profits, Gross Deposits, National Bank Notes, Bills Payable and Rediscounts.

NOTE: Statistically, these data are not arithmetical averages, but are percentages which were found to be most nearly *typical* of the *greatest number* of banks. This method was used in order to avoid giving too great weight to a few extremely high or extremely low figures The largest bank carries no greater weight than the smallest.

term "Rent," and with no uniform application of the term, its meaning in the past has varied so widely that amounts reported for the item have not been comparable; moreover, this difficulty has been further complicated in the case of banks which have made no provision for charging themselves rental for quarters occupied in their own buildings. Accordingly, to meet these conditions Schedules B and C have been devised and are described with the necessary definitions below:

Schedule B. For Leased Quarters. The purpose of this schedule is fully explained in the text at the head of the schedule. For *Item B 1* there should be entered the *aggregate* amount actually paid the landlord or landlords under the terms of a lease for any and *all* quarters occupied by the bank (*i.e.*, the amounts paid for rental for the head office if leased, and for all branches leased, should be consolidated here); the remaining items, B 2 to B 10 inclusive, are intended to cover various collateral expenses of occupancy which may not be provided for and paid by the landlord under the terms of the lease. *Item B 13 of this Schedule plus Item C 1 of Schedule C* will give the total expense of Occupancy to be entered as Item 34 of Schedule A.

Schedule C. For Quarters in Buildings Owned by the Bank. The various items of this Schedule should be the *aggregate* of the receipts and expenses respectively of *all* buildings owned by the bank, both for the head office and all branches. If the bank charges itself rental for quarters occupied, that amount should be entered for *Item C 1,* and the basis of the charge, *i.e.*, whether as the result of an appraisal of the rental value of the buildings or some other basis, should be explained on Page 11; if, however, the rental charged has no direct relationship to the estimated rental value of the quarters, or if it has not been the custom to make any charge, it is suggested that for statistical purposes there be entered as Item 1, an amount which is 50 per cent more than the total cost of maintaining the building as reflected by *Item C 19, less* the amount, if any, received from tenants and for other credits. For example, if the total of Item C 19 is $50,000, the rental value of the building may in most cases be fairly put at $75,000 which would be the amount entered for Item C 4, from which the sum of Items C 2 and C 3 should be deducted and the remainder entered as Item C 1. This *Item C 1 plus Item B 13* of Schedule B will give the total expense of occupancy to be entered as Item 34 of Schedule A.

The results of these questionnaires, as computed by the Federal Agent's Department, may be seen as follows for the year 1928.

Of what value would this information be to a member bank?

What conclusions may be drawn from the tables as to the profitableness of different kinds of banking business? Of banks of different size?

Do the conclusions indicated in answer to the preceding question seem reasonable?

Can any conclusions be drawn from a comparison of Forms 1 and 2 as to the relative amounts of time deposits handled by large and small banks?

What were the advantages of the new figures as compared with those collected prior to 1926?

5. UNIFORM RECORDS FOR BANKS

COSTS AND INCOME: INTO HOW GREAT DETAIL MAY BANK RECORDS BE CARRIED TO SECURE GENERAL ADOPTION AS A UNIFORM SYSTEM?

Observing the growing interest of bankers in cost and income analysis, H. V. Elliman, an officer of one of the Federal Reserve banks, sought to encourage the keeping of such records by the member banks of that district, and the exchange of figures and ideas which might be helpful. His bank was already collecting figures of the larger elements of bank income and expense, similar to those published by the Federal Reserve Bank of Boston,[1] but he felt that these statistics would be more reliable if the member banks could be induced to keep records in greater detail and on a uniform basis, and also that the banks themselves would benefit from the additional information which would be available to their officers. With these ideas in mind, he prepared a manual to serve as a basis for further discussion; in it the income and expense items of a bank were arranged in systematic order, on a plan related to the bank's activities. He, therefore, first constructed a chart (Form 1) in which the functions of a bank were laid out in two main divisions, the Overhead or General Activities, and the Institutional or Specific Banking Activities. From this chart, a list of accounts was prepared, with code numbers to show their interrelations, to this list were appended detailed explanations of the various accounts. The nature and

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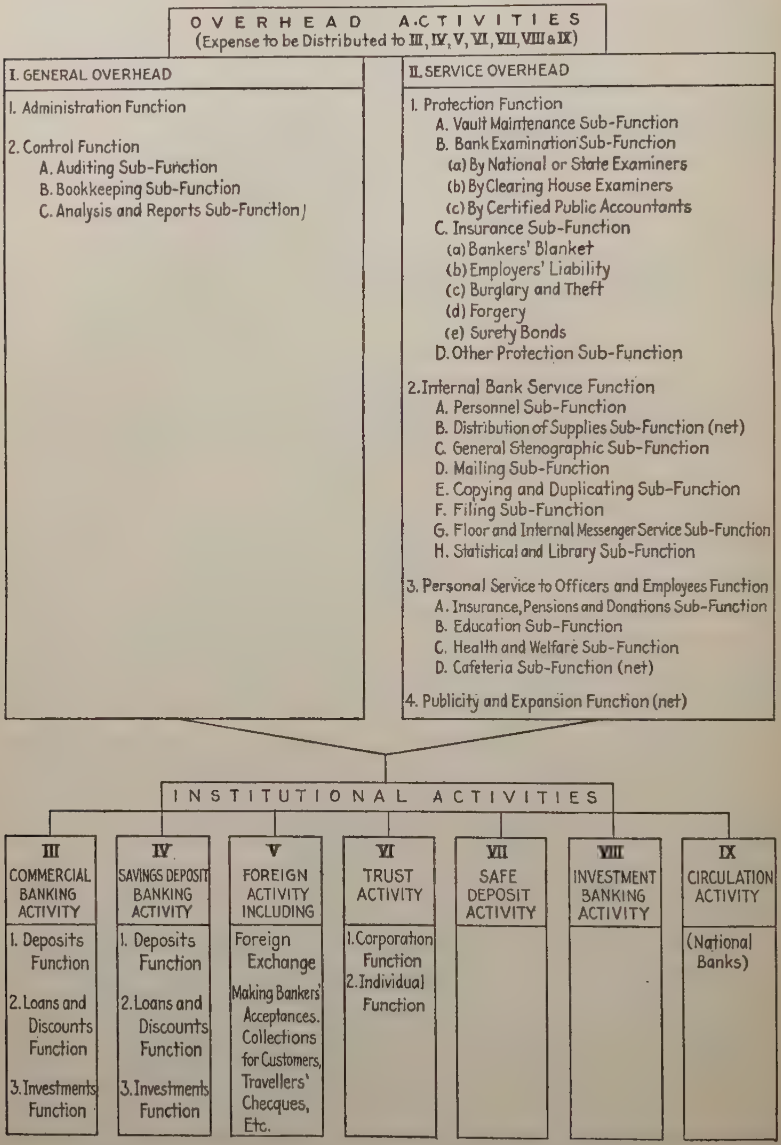
[1] See Case 4. Chapter VIII, B.

PLAN FOR A FUNCTIONAL CLASSIFICATION OF BANK EXPENSES



OVERHEAD ACTIVITIES
(Expense to be Distributed to III, IV, V, VI, VII, VIII & IX)

I. GENERAL OVERHEAD

1. Administration Function

2. Control Function
   A. Auditing Sub-Function
   B. Bookkeeping Sub-Function
   C. Analysis and Reports Sub-Function

II. SERVICE OVERHEAD

1. Protection Function
   A. Vault Maintenance Sub-Function
   B. Bank Examination Sub-Function
      (a) By National or State Examiners
      (b) By Clearing House Examiners
      (c) By Certified Public Accountants
   C. Insurance Sub-Function
      (a) Bankers' Blanket
      (b) Employers' Liability
      (c) Burglary and Theft
      (d) Forgery
      (e) Surety Bonds
   D. Other Protection Sub-Function

2. Internal Bank Service Function
   A. Personnel Sub-Function
   B. Distribution of Supplies Sub-Function (net)
   C. General Stenographic Sub-Function
   D. Mailing Sub-Function
   E. Copying and Duplicating Sub-Function
   F. Filing Sub-Function
   G. Floor and Internal Messenger Service Sub-Function
   H. Statistical and Library Sub-Function

3. Personal Service to Officers and Employees Function
   A. Insurance, Pensions and Donations Sub-Function
   B. Education Sub-Function
   C. Health and Welfare Sub-Function
   D. Cafeteria Sub-Function (net)

4. Publicity and Expansion Function (net)

INSTITUTIONAL ACTIVITIES

III COMMERCIAL BANKING ACTIVITY
1. Deposits Function
2. Loans and Discounts Function
3. Investments Function

IV SAVINGS DEPOSIT BANKING ACTIVITY
1. Deposits Function
2. Loans and Discounts Function
3. Investments Function

V FOREIGN ACTIVITY INCLUDING
Foreign Exchange
Making Bankers' Acceptances. Collections for Customers, Travellers' Checques, Etc.

VI TRUST ACTIVITY
1. Corporation Function
2. Individual Function

VII SAFE DEPOSIT ACTIVITY

VIII INVESTMENT BANKING ACTIVITY

IX CIRCULATION ACTIVITY
(National Banks)

FORM 1.

extent of these explanatory statements may be judged from the fact that in all they constituted something over 100 pages of typed matter. The following excerpt is an example of the treatment of overhead accounts:

---

100. GENERAL OVERHEAD Activity, namely, expenses incurred by, or on behalf of, or for the information of the directors and those officers whose duties are concerned only with determining the policies of the bank, with respect to, for example, loans and investments, economy and efficiency of management, attitude toward the public, etc. The functional subdivisions of GENERAL OVERHEAD and the items entering into each are:

110. ADMINISTRATION Function.

Salaries and Services:

.1 Directors' fees ....

.2 Officers' salaries; including salaries, or *portions* of the same, of the Chairman of the Board of Directors (if such officer is paid a regular compensation other than, or in addition to, the usual Director's fee), president, assistant to president, and such vice-presidents and their assistants whose duties are wholly general in character, having to do with determining (under the Board of Directors) the policies of the bank affecting credits, loans, investments, etc.—and which cannot properly be made a direct charge against a specific institutional activity or function. (Do not include here attorney's fees, retainers or other expenses for legal services). ....

.3 Regular employees (salaries or portions of same, of secretaries, stenographers and other clerical employees whose duties are personal to the above and which cannot properly be made a direct charge against a specific institutional function); also such portions of salaries of employees engaged in handling mail, duplicating processes, filing, and operating telephones, as may properly and readily be apportioned to this function. (Do not include under this item any salaries incident to Occupancy reported on Schedule B). ....

Total forward ....

Coming to the banking activities proper, the following examples illustrate how these were presented.

SECTION II

INSTITUTIONAL ACTIVITIES

RECEIPTS

(Direct Credits to Institutional Activities)

300R. COMMERCIAL BANKING Activity
  310R. DEPOSITS Function
    .1 Domestic exchange charges ....
    .2 Charges for collection of notes, bonds, drafts, etc. ....
    .3 Charges for handling small accounts ....
    .4 Charges for issuing bank drafts ....
    .5 Interest on amounts due from other banks arising from checks, notes and drafts deposited for collection purposes—so-called "collection accounts." ....
    .20 All other credits to this function, including recoveries on small losses. ....

  310R. Total forward ....

PAYMENTS

(Direct Charges to Institutional Activities, Functions and sub-Functions)

300. COMMERCIAL BANKING Activity
  310. DEPOSITS Function
    310A. *General Functional Expenses*

      Interest paid on:
      .155 Accounts of banks and bankers arising from checks, notes and drafts deposited for collection purposes: so-called "Collection Accounts." ....
      .156 Certificates of deposit ....
      .157 Commercial or checking accounts ....
      .158 Public funds ....
      .159 Balances of branches on deposit at head office ....
      .160 All other interest paid. ....

      .161 Total, Interest ....
      .162 Penalties for insufficient reserves at Federal Reserve Bank. ....
      .163 Exchange charges. ....
      .164 All other debits to this function (including small losses charged off) except for current operating expenses as itemized below. ....

    310A. *Total, General Functional Expenses...* ....
    310B. *Current Operating Expenses*

REPORT NO. 1.—SUMMARY OF RECEIPTS AND PAYMENTS BY ACTIVITIES AND MAJOR FUNCTIONS FOR THE MONTH OF

Principal Items of Receipts and Payments	Items from Schedule A	Grand Total	Overhead											Institutional														
			(I) General			(II) Service					Total	(III) Commercial Banking				(IV) Savings Deposit Banking				(V) Foreign	(VI) Trust			(VII) Safe Deposit	Total
			Administration	Control	Total	Protection	Internal Bank Service	Personal Service	Publicity and Expansion	Total		Deposits	Loans and Discounts	Investments	Total	Deposits	Loans and Discounts	Investments	Total		Corporation	Individual	Total		
A. Receipts:																									
1. Interest and Discount Earned		216,700	*	*	*	*	*	*	*	*	*	1,700	148,000		149,700		67,000		67,000	*	*	*	*	*	216,700
2. Other Earnings		280,300	*	*	*	*	*	*	*	*	*	300	2,000	137,000	139,300	2,000	1,000	100,000	103,000	3,000	20,000	14,000	34,000	1,000	280,300
3. Total		497,000	*	*	*	*	*	*	*	*	*	2,000	150,000	137,000	289,000	2,000	68,000	100,000	170,000	3,000	20,000	14,000	34,000	1,000	497,000
B. Payments:																									
4. Salaries, except legal	.99	66,000																							
5. Advertising—in newspapers, magazines, etc.	.150, .151	2,000																							
6. Advertising—pamphlets, calendars, etc.	.152, .153, .154	1,000																							
7. Books and Periodicals	.106	260																							
8. Cafeteria, net	Sub-Function 234	80																							
9. Delivery service for customers	.147, .148, .149	100																							
10. Delivery service for bank	.131, .132, .133	100																							
11. Donations	.105, .137, .144	1,000																							
12. Examinations	Sub-Function 212	5,000																							
13. Furn., Eq. and Fix., inc. repairs on same	.102, .103	1,495																							
14. Information Services	.107	650																							
15. Legal, inc. fees, retainers and salaries	.118	6,000																							
16. Membership dues	.115	500																							
17. Occupancy	.101	24,000																							
18. Premiums on surety bonds	.116	500																							
19. Insurance, premiums on Protective	.126 to .130 inc.	300																							
20. Insurance, premiums on Group	.135	300																							
21. Pensions, reserve for	.136	2,000																							
22. Printing, Stationery and Office Supplies	.109	4,000																							
23. Postage	.108	2,000																							
24. Taxes, other than on Real Estate	.104	14,000																							
25. Telephone and Telegraph	.110, .111, .112	2,000																							
26. Travel	.113, .114	400																							
27. All other, except Interest		2,200																							
28. Total, before adjustment for Line 29		135,885	36,195	2,575	38,770	8,120	4,760	4,040	4,975	21,895	60,665	16,270	26,965	2,525	45,760	2,155	1,245	3,030	6,430	3,560	7,000	7,870	14,870	4,600	75,220
29. Stock account adjustment (+ or −)		−665	*	*	*	*	*	*	*	−665	−665	*	*	*	*	*	*	*	*	*	*	*	*	*	*
30. Total, net payments, except Interest		135,220	36,195	2,575	38,770	8,120	4,760	4,040	4,975	21,230	60,000	16,270	26,965	2,525	45,760	2,155	1,245	3,030	6,430	3,560	7,000	7,870	14,870	4,600	75,220
31. Interest	.161	230,000	*	*	*	*	*	*	*	*	*	100,000			100,000	130,000			130,000	*	*	*	*	*	230,000
32. Total Payments (net)		365,220	36,195	2,575	38,770	8,120	4,760	4,040	4,975	21,230	60,000	116,270	26,965	2,525	145,760	132,155	1,245	3,030	136,430	3,560	7,000	7,870	14,870	4,600	305,220
C. Net Operating Income (+) or Net Cost (−) of Institutional Activities and Major Functions before distribution of Overhead		191,780	*	*	*	*	*	*	*	*	*	−114,270	+123,035	+134,475	+143,240	+130,155	+66,755	+96,970	+33,570	−560	+13,000	+6,130	+19,130	−3,600	191,780
D. Distribution of Overhead to Institutional Activities		−60,000	*	*	*	*	*	*	*	*	*				−36,480				−5,100	−2,880			−11,880	−3,660	−60,000
E. Net Earnings (+) or Losses (−) by Institutional Activities after distribution of Overhead and before Recoveries and Charge-offs		+131,780	*	*	*	*	*	*	*	*	*				+106,760				+28,470	−3,440			+7,250	−7,260	+131,780

Entries for payments to be made in these spaces should be the corresponding totals transferred from Schedule A, and should add horizontally to the amounts entered in the first, or Grand Total, column at the left; and should add vertically to the footings of the respective columns as entered on Line 28.

FORM 2.

Uniform Records of Banks

(To face page 682)

[illegible]

[illegible] except Journals.

Advertising [illegible]

Advertising [illegible]

Books and Periodicals ......

Club [illegible]

Dinners [illegible]

[illegible]

membership dues......

[illegible]

[illegible] payable

Real Estate......

From these records, if kept as described, it was expected that certain reports would be made available monthly to the bank's officers. Form 2 was to be a monthly summary of receipts and payments by activities.

Form 3 would show the total amounts of the various items of receipts and payments serially and monthly in two six-monthly periods, but without reference to the banking departments. A number of other reports were proposed, for the most part being subdivisions and further analyses of Forms 2 and 3.

When the manual had been completed, a number of men likely to be interested in the project were called into conference, to discuss whether the plan was likely to meet with general adoption, and if so, how it might be improved. After some specific criticisms, of such matters as the use of Receipts and Payments as apparently identical with Income and Expense, the vice-president of one of the larger banks announced that while the objects in view were commendable, he feared that the plan was too ambitious, that the manual was formidable enough to discourage most bank officers, and that any attempt to promulgate it might endanger the gathering of the simple statistics which the Federal Reserve Bank was already gathering with some success. He stated that his bank had gone as far as any in that locality in cost and income analysis, yet he believed that any attempt to introduce the proposed system would meet with dismay and resistance; much less, then, would smaller banks be favorably impressed by it. The larger banks were likely to have well-developed accounting systems of their own, which they would not be willing to change for this one; and the smaller banks would consider it too much for them.

This statement determined the issue of the conference: it was decided not to proceed further with any efforts to promulgate this plan, but to extend the range of the statistics already being gathered, by gradually adding items from time to time, which might be readily furnished by the banks, and would be of interest to them when published as composite figures.

Do you agree with the result arrived at?

Do any other criticisms of the plan occur to you?

REPORT NO. 2—PRINCIPAL ITEMS OF RECEIPTS AND PAYMENTS BY MONTHS AND SIX MONTHS' PERIODS

Principal Items	Items from Schedule A	First Six Months of Current Year							First Six Months of Last Year	Second Six Months of Current Year							Second Six Months of Last Year	Total	
		Jan.	Feb.	Mar.	Apr.	May	June	Total		July	Aug.	Sept.	Oct.	Nov.	Dec.	Total		Current Year	Last Year
A. Receipts:																			
1. Interest and Discount Earned		216,700																	
2. Other Earnings		280,200																	
3. Total		497,000																	
B. Payments:																			
4. Salaries, except legal	.99	66,000																	
5. Advertising—in newspapers, magazines, etc.	.150, .151	2,000																	
6. Advertising — pamphlets, calendars, etc.	.152, .153, .154	1,000																	
7. Books and Periodicals	.106	260																	
8. Cafeteria, net	Sub-Function 234	80																	
9. Delivery service for customers	.147, .148, .149	100																	
10. Delivery service for bank	.131, .132, .133	100																	
11. Donations	.105, .137, .144	1,000																	
12. Examinations	Sub-Function 212	5,000																	
13. Furn., Eq. and Fix., inc. repairs on same	.102, .103	1,495																	
14. Information Services	.107	650																	
15. Legal, inc. fees, retainers and salaries		6,000																	
16. Membership dues	.118	500																	
17. Occupancy	.115	24,000																	
18. Premiums on surety bonds	.101	500																	
19. Insurance, premiums on Protective	.116	300																	
20. Insurance, premiums on Group	.126–.130 inc.	300																	
21. Pensions, reserve for	.135	2,000																	
22. Printing, Stationery and Office Supplies	.136	4,000																	
23. Postage	.109	2,000																	
24. Taxes, other than on Real Estate	.108	14,000																	
25. Telephone and Telegraph	.104	2,000																	
26. Travel	.110, .111, .112	400																	
27. All other, except Interest	113, .114	2,200																	
28. Total, before adjustment for Line 29		135,885																	
29. Stock account adjustment (+ or —)		—665																	
30. Total, net payments, except Interest		135,220																	
31. Interest	.161	230,000																	
32. Total Payments (net)		365,220																	

FORM 3.

Uniform Records for Banks

What figures would you recommend a Federal Reserve bank to gather, for the compilation of general statistics of cost and income?

6. Moulton National Bank

ACCOUNT ANALYSIS: WHAT INFORMATION IS DESIRABLE FOR DETERMINING THE PROFITABLENESS OF CUSTOMERS' ACCOUNTS?

The Moulton National Bank was a large institution, the officers of which were alert to use all available means of strengthening its business, and of increasing its profits. They were conscious that the decline which had taken place in recent years in the margin between interest earned and interest paid, combined with the increased costs of rendering service to customers, generated by growing competition to secure accounts, had brought the net profits on various types of business to very narrow proportions; there was more and more question as to whether certain accounts were profitable or not. The officers wished, therefore, to use a form of account analysis which would serve as an index of profitability, and would not be too cumbersome; the procedure described in the succeeding paragraphs had been in use for several years, and had given satisfaction.

INCOME FROM AN ACCOUNT

It was first necessary to determine what the account of a particular customer yielded as income to the bank. To do so the amount of loanable money which the account provided had to be found; this sum was considerably less than the average balance shown in the account itself, because this balance included items deposited by the customer but not yet collected by the bank, and therefore not available to it; these items were commonly called float. The amount of float was computed by dividing the items passing through an account during the month into those which could be collected in one day, in two days, in three days, and so on; these several totals, multiplied by the number of days each was outstanding, would give the total amount unavailable to the bank during the month, on a per day basis. This amount was deducted from the total of the daily balances of the account during the month; the remainder, divided by 30, gave the amount of loanable funds available all through the month. But all of this was not available for investment, since the bank had to maintain the legally required reserves of 10%, and in addition had to keep a certain amount of ready money on hand; to meet these needs 11% was treated as necessary reserve, and the balance was the amount actually available for loaning by the bank. The calculation may be illustrated briefly as follows:

ACCOUNT OF J. E. EDGAR

Average daily balance	$7,321.80
Average daily float-uncollected items	1,674.60
Average daily collected balance	$5,647.20
Less 11% for legal and cash reserve	621.17
Average loanable funds	$5,026.03

On this last amount the bank might expect to earn a return at the average rate made on all its earning assets, and this return constituted the gross earnings of the account.

HANDLING COSTS OF THE ACCOUNT

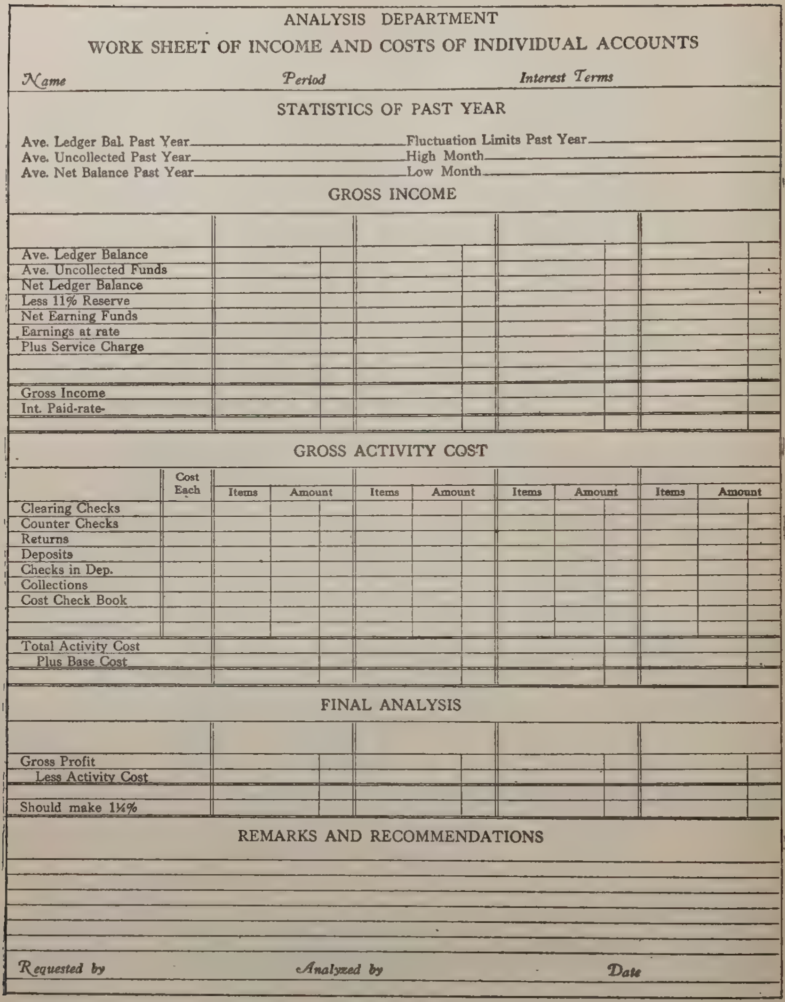
It next became necessary to find the cost of handling the account, a sum made up of two main parts. It cost the bank a certain sum to open an account, and to maintain it upon the books, without any sort of activity; the other part of the cost was for handling the various types of items which passed through the account. These costs were found, as to total amount, by a distribution of salaries and other expenses to the activities handled, by a form resembling the departmental distribution sheet of a manufacturing concern. The greater part of the expenses could be charged directly to some specific activity; the balance of the departmental expenses were prorated with little difficulty to the several types of items handled by the department; the entire plan of distribution was simplified by the fact that no charges were made to accounts to cover the general overhead of the bank. When the total cost of each class of items had been arrived at, it was divided by the total number of that class of items handled, to give a unit cost. The bank officers had ascertained that some banks contented themselves with finding a single uniform cost for all items, without differentiation among the various classes. Two considerations, however, led them to conclude that it was desirable in their case to find the cost of handling each type of item; in the first place even a rough study indicated wide disparity among the several unit costs; whereas a check drawn on the bank itself and cashed over the counter cost about 4 cents to put through, a check on another bank, received as a deposit, and cleared through the clearing house, could be handled for approximately 1 cent. Similar differences occurred with other items, and it was not considered that an average cost would give sufficiently accurate results; separate costs were therefore computed for seven different kinds of items, as shown in the "Gross Activity Cost" section of Form 1. The other reason why this was done was that these activities were more sharply divided in the Moulton National Bank than they could be in a smaller bank, so that it was much easier to apportion the costs.

The standard charge to each account, the "base cost," as it was called, was figured at $3 per annum, a figure which was the same as that recommended by the New York State Bankers' Association, in its *Report of Committee on Bank Costs*, some banks used a higher figure for this purpose.

FINAL RESULTS

The gross earnings of the account were then compared with the total costs in the "Final Analysis" section of Form 1, thus giving a figure of Net Earnings. As a check on this the bank had computed that net earnings equal to 1¼% should be made on all loanable funds; this result was arrived at by considering that 8% was a fair return of net profit to be made on the combined capital and surplus of the bank, and that the total of such loanable funds was just over six times the combined capital and surplus; a return of 1¼% on loanable funds would therefore yield 8% on the total invested capital.

A summary of these results was put together in Form 2, to



ANALYSIS DEPARTMENT

WORK SHEET OF INCOME AND COSTS OF INDIVIDUAL ACCOUNTS

Name *Period* *Interest Terms*

STATISTICS OF PAST YEAR

Ave. Ledger Bal. Past Year______ Fluctuation Limits Past Year______
Ave. Uncollected Past Year______ High Month______
Ave. Net Balance Past Year______ Low Month______

GROSS INCOME

Ave. Ledger Balance				
Ave. Uncollected Funds				
Net Ledger Balance				
Less 11% Reserve				
Net Earning Funds				
Earnings at rate				
Plus Service Charge				
Gross Income				
Int. Paid-rate-				

GROSS ACTIVITY COST

	Cost Each	Items	Amount	Items	Amount	Items	Amount	Items	Amount
Clearing Checks									
Counter Checks									
Returns									
Deposits									
Checks in Dep.									
Collections									
Cost Check Book									
Total Activity Cost									
Plus Base Cost									

FINAL ANALYSIS

Gross Profit				
Less Activity Cost				
Should make 1¼%				

REMARKS AND RECOMMENDATIONS

Requested by *Analyzed by* *Date*

FORM 1.

facilitate reference to them. Both in Form 1 and in Form 2 the several columns are provided to contain the figures of successive months, in order to show if any marked trend or movement was at work.

ANALYSIS OF ACCOUNT

Name — Period

Account Opened — By — Interest Terms

Borrowing (class and amount, at present time) { Own / Coll. / Rec.

Ave. Daily Ledger Bal. past year — Ave. Daily Coll. Bal. past year

Normal Fluctuation — High — Low

Average Daily Net Loanable Funds for period

RECAPITULATION OF PROFIT

Month				
Gross Earnings				
Less Interest				
Gross Profit				
Less Activity Cost				
Net Profit				
Estimated return 1¼%				

Contacts, affiliations, etc.

Officer's Ruling — Action

Drawn Down Balance (flag) — Analysis frequency

Bring up (date) — Officer's Initials

Moulton National Bank

FORM 2.

WHICH ACCOUNTS SHOULD BE ANALYZED?

The next question to come up was whether all accounts should be subjected to this treatment; to do so would involve a formidable amount of work. It was soon decided to analyze all the larger accounts, and all those which displayed unusual features, such as an abnormal quantity of items, or a large proportion of outstanding amounts not collected. One of the advantages of making the analysis in the first place was that such abnormalities were much more readily recognized than before; having found that a certain amount of available balance would support a certain item activity, anything different from this was more noticeable. This group of accounts constituted less than 20% of the total number, however, and it was desirable to find some means of quickly reviewing many of the others. A number of standard tables were therefore constructed, for accounts with average balances of $50, $100, $150, $200, $300, and so on; for each figure the number of checks which could be drawn, the amount of float, the number of items to be deposited for collection, and other aspects of account of activity were indicated, which would yield the desirable profit. This table could then be used as a measuring stick for all accounts of that magnitude, and any items out of line would be quickly detected. In this way a large number of accounts could be passed in rapid review, and some assurance gained that no very unprofitable accounts were being carried without it being known.

APPLICATION OF THE ANALYSIS RESULTS

What to do with unprofitable accounts was the main question arising from the results shown. With increasing competition to secure accounts, the bank officers were little disposed to take any steps which would tend in any way to the loss of an account to another bank; they recognized that there were probably intangible values in having an account, which were not reflected in the formal analysis. Their efforts tended therefore in two main directions; if an account were unprofitable they endeavored to effect some change in it which would render it profitable; if nothing could be done in this direction, and it remained unprofitable, they would consider whether there were not some off-setting factors which, in spite of the figures might make it expedient for them to keep the account. Under the first heading the possibilities were to suggest to the customer that he reduce the number of items going through or that he endeavor to keep an increased average balance; failing some remedy of this sort he might be asked to pay a small service charge. The entire procedure was, however, based on amicable relations with the customer; in all cases the main reliance would be an appeal to his reason when the facts were laid before him. As to considerations of the second type, it might be that the small account would grow into a large one; the customer might be a desirable type for the bank to cultivate; he might be influential in bringing other business to the bank, or he might be related to somebody keeping a large account. Matters of this nature were practical considerations which would induce the officers to accept a condition which on its face did not appear profitable.

For several years the bank had treated its customers' accounts in this way; there had been no apparent loss of customer goodwill, in fact the business of the bank increased rapidly during the period; and it was felt that the work of account analysis had gone far to keep the business of the bank on a profitable basis. In the majority of instances unprofitable accounts could, by one or other of the means indicated, be converted into profitable ones.

Was the procedure followed in the analysis of accounts a sound one?

Do you approve the bank's policy with regard to using the results of account analysis?

PART V

ORGANIZATION AND INDUSTRIAL CONTROL

IX

ORGANIZATION OF COST AND ACCOUNTING DEPARTMENTS

1. Sedalia Railroad Company

ACCOUNTING WORK: SHOULD ACCOUNTING WORK BE CENTRALIZED OR DECENTRALIZED?

The Sedalia Railroad Company was organized in the early years of the last decade to acquire the stock of a number of small roads. In this amalgamation many of the officials of the small roads were retained in various executive positions in the new company. This complicated the situation somewhat from an accounting standpoint because each of the executives understood his own method of reporting and accounting for the various transactions and was opposed to a change. At the same time it was undesirable for the Sedalia Railroad Company to have different reports coming from different divisions of the unified system; in addition the requirements of the Interstate Commerce Commission had to be met which made uniformity of reporting imperative.

The company from its inception was profitable and consequently grew rapidly, new roads being acquired and branches constructed from time to time. The accounting system during this time was improved and standardized as the size of the system more and more required uniformity and the prejudices of the various executives were gradually overcome.

In this growth, however, although the company solved the problem of standardization and uniformity, it found itself rapidly facing another problem. This new problem was that of deciding whether the accounting work should be centralized or decentralized, a question obviously brought about by the tremendous increase in the size of the company.

The scope of the problem can best be understood by considering one of the many branches of the accounting work. Repairs and maintenance of roadways, for instance, were constantly being carried out on the various divisions of the road; the work was done by a gang of men, usually foreigners, under the direction of a foreman, who in turn was receiving his instructions from a division superintendent. This minute division of labor was carried throughout the system up to the major executives, which meant that if each person along the line made out a report, and each report was turned into the centralized accounting department the multiplicity of reports would become confusing and deterrent to rapid work.

It was possible for each responsible person to summarize the reports handed to him from the various men beneath him, which would mean that the final number of reports handed into the main office would be few and presumably well worked out, because of the great number of people scrutinizing them. There was the objection, however, that the files in the central office would lack detailed information in case any study or investigation should be desired or made.

If the accounting department was decentralized, each division or group of divisions would have an accounting department to record all the transactions occurring within its realm. The number of reports handled by any one office would under this method be comparatively small, but it meant that the information pertaining to the system as a whole would be diffused and, unless carefully watched, might tend to lose its uniformity.

When it was realized that the maintenance of way was but one of a great number of departments operating, the immensity of the problem became apparent and it was easy to understand that the various executives of the road were more and more being pressed by circumstances for a solution. Not only one, but all railroad companies were faced with this type of problem, chiefly because of their enormous size.

In a case of this kind what can be done to solve the problem and yet, at all times, accumulate adequate data?

2. Amazon Products Company

ACCOUNTING CONTROL: WHERE A COMPANY OPERATES MANY PLANTS, SHOULD THE ACCOUNTING WORK BE CENTRALIZED OR DECENTRALIZED?

The accounting work of the Amazon Products Company had become tremendous in size and complicated in operation because of the new companies that had been acquired from time to time. The company originally started as a small concern, but, because of competition and because the idea was prevalent that one large corporation would prove more profitable than a number of small ones, gradually grew until it was one of the largest corporations in this country. Two types of units had been acquired, including about 40 manufacturing plants, and some 200 selling companies.

The home office of the company was in New York City, and the vice-president in charge of accounting had always been of the opinion that the accounting work should be centralized in the home office, on the ground that the units, once consolidated, all formed one large company and that there was no need for each company to continue to maintain its separate identity, either from an accounting point of view or otherwise. In addition the vice-president felt that, with such a great number of divisions, standardization and uniformity of accounting was imperative, but was impossible if each plant and branch was left to do its own accounting work in its own way.

At first it had been difficult to convince the manufacturing plants that they were a part of one large organization and that they could make a profit only when it made a profit. By gradual education, however, this idea had become commonly accepted and the various plants had acquiesced in their accounting work being done in the home office. Nevertheless, there were from time to time questions arising as to the soundness of the policy of centralization of the accounting work and on each of these occasions one argument was always presented, namely, that if each plant accounted for its work the executive in charge would have a better control and thereby a better chance to deal with any difficulties that might present themselves. On the other hand, there was a certain amount of control the plant executives could never have because all financial measures and budget programs were dictated from the home office, which meant that in any case the plant executives were limited in their initiative.

In the case of the selling branches the vice-president had been less successful in his policy of centralization; the various branch managers refused to let the home office do their accounting work, contending that they could get the best results only by operating the branches as if they were their own businesses and doing all the work connected therewith. The vice-president replied that this argument had little validity since the home office charged the branches with the stock they sold at a figure higher than cost and the percentage of mark-up was not known by the selling branch. If the profit of the latter became too large, the home office would probably increase the price at which it billed the branches with merchandise. Further than that, whatever profit was made in the branches was sooner or later taken over by the home office in the form of dividends, so that no surplus could ever be accumulated on the books of the selling branches. With the general accounting conditions as described, the vice-president was in a quandary as to what action he should take, especially as he was anxious to avoid any organization difficulties. But with the accounting work half centralized and half decentralized, his department was not working as smoothly and consistently as he desired. Since he was responsible for the accounting work he wanted to get it organized on a consistent and uniform basis.

If you had been the vice-president in this case, what action would you have taken?

Where there are a large number of divisions operating, would you consider centralization a wise organization plan in its general application?

How do you account for the fact that the manufacturing plants were willing to have their accounting work centralized, while the selling companies were not?

3. Hadfield Electric Company

CONTROLLER'S DEPARTMENT: WHAT IS THE MOST EFFECTIVE ORGANIZATION WITHIN THE CONTROLLER'S DEPARTMENT?

The accounting organization of the Hadfield Electric Company had gone through a number of transformations, partly arising from changes in the personnel near the head of the accounting organization, and partly from changes among the executive heads of the company. The latter frequently differed among themselves as to the attitude and function of the accounting department within the organization, especially as to whether it was to be purely an accounting and reporting organization, or whether it should be at liberty to make suggestions to the operating departments. It seemed reasonable to encourage the latter, but questions then arose as to the amount of force which these suggestions should carry; if they were in conflict with the views of certain operating heads, which view should prevail? An aggressive controller, in charge of the department for a number of years, had been able to impose his opinions upon the general company organization to an extent which was somewhat resented by the operating heads; a change of president, and a change of controller, occurring somewhat near together, though entirely unconnected, promised to bring about a reversal of this condition. The new president supported the operating managers in emphatic terms and intimated that all accounting work and organizations would be in accordance with their wishes, and not subject to dictation by accounting men.

At one stage in these discussions the controller had prepared a chart showing the organization of his department: a copy of this is given in Chart 1. A question which arose frequently out of this organization concerned the precise status of the three assistant auditors; was it intended that each should have exclusive authority within his own department, to the extent that any one of them, seeking information in the department of another, would have to go through that other assistant auditor? It will be seen that the first of the assistant auditors was in charge of the corporate records, and of everything which had to do with the corporate organization of the business; but he was among other things in charge of appropriation records and of employment information; and special assignments might be made to him. In his case it was clearly necessary that he should have the right of access to records under the other assistant auditors. The second assistant auditor was in charge of general ledger accounts and of customers' and creditors' accounts. For purposes of the general ledger he would frequently need information concerning the makeup of figures on factory inventories and cost, which were under the control of the third assistant auditor. In all these cases it would involve much duplication of work if these assistant auditors had to go to each other for information instead of being able to go directly to the men in the departments who were actually handling the records in question. Even if it did not involve recopying, or more copies of information prepared, it would at least mean duplication of instructions from the assistant auditor calling for the information, and further duplication when the information came to be transmitted to him.

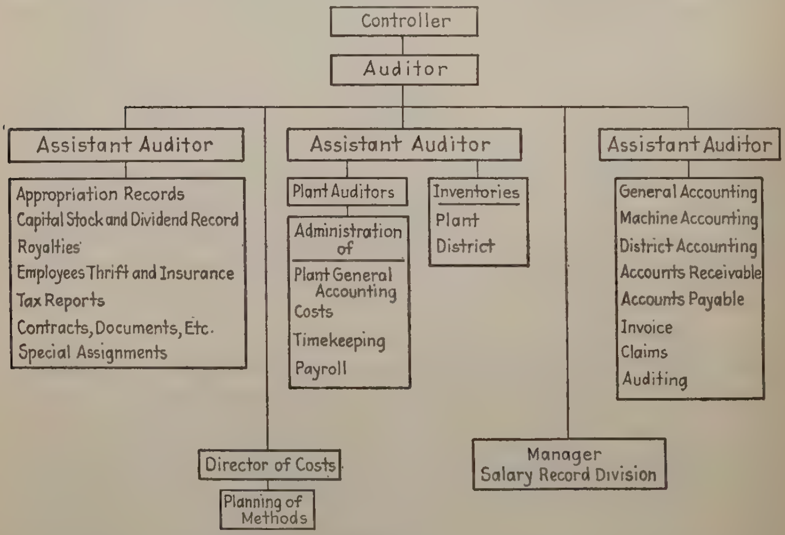

Controller
Auditor
Assistant Auditor
Appropriation Records
Capital Stock and Dividend Record
Royalties
Employees Thrift and Insurance
Tax Reports
Contracts, Documents, Etc.
Special Assignments
Assistant Auditor
Plant Auditors
Administration of
Plant General Accounting
Costs
Timekeeping
Payroll
Inventories
Plant
District
Assistant Auditor
General Accounting
Machine Accounting
District Accounting
Accounts Receivable
Accounts Payable
Invoice
Claims
Auditing
Director of Costs
Planning of Methods
Manager
Salary Record Division

CHART 1.

Other questions were likely to appear with regard to the staff assistant in the lower part of the chart, known as "Director of Costs." What was his authority, and what was to be the situation if his suggestions and recommendations were not acceptable to the assistant auditors in charge of the various divisions?

Another large and constantly occurring problem was the question of the position of all cost work. In the chart it was in charge of the third assistant auditor and eventually under the controller. Many in the organization believed that this part of the work should be under the direct authority of the works manager. In this matter the position of a large company was believed to differ from that of a small one. The latter could normally afford to employ two men of outstanding ability as heads of two divisions of accounting work; it was therefore reasonable to place all of it under the auditor or controller. But this restriction did not apply in the large plant, where many arguments favor letting the operating men provide their own cost department, subject only to a functional control from the auditor's department to see that suitable forms were used for the purposes in mind, and that proper costs and proper inventories were prepared.

The officers thought that, to get the best results, an unusual degree of sympathy was called for between the cost department and the works operating staff. They had observed that purely accounting men accommodated themselves very poorly to these requirements and were too much inclined to a stand-off and perhaps dictatorial attitude. It further appeared that many heads of departments, such as purchasing, planning and scheduling, and others had been developed from works accountants, but very seldom from general accountants. One thing which seemed to contribute to this result was the ability of the true works accountant to show a sense for approximations which were good enough for the purpose in hand, and yet did not involve too minute and extensive records or computations. The general accountant, it was asserted, was so devoted to an exact balancing and agreement in minute matters, that he seemed unable to adapt himself to such conditions. He was, for example, generally unsuccessful on time-study work; this required an ability to be friendly with the men, to make allowances for conditions out of the ordinary, and to see the difference between essentials and trifles.

There was something of the same contrast within the works accounting department, on different types of work. In time-study work for setting manufacturing standards on quantity production, a high degree of accuracy was desirable though it might be necessary to take many variables into account. But another sort of standard was required when it came to estimating on special apparatus for customers' orders, perhaps as a basis for quotations, or if not, to set a rough standard, after the order had been obtained, with which to compare actual costs. In the latter case it was simply a choice between having a rough, easily computed standard, or no standard at all. Some men got trained to the point where they could give a per pound estimate on complicated engineering jobs, just by studying the drawings; this meant that the whole procedure of figuring separately on numerous parts was avoided. But to put a typical financial accountant on such work was like putting a fine tool-maker on commercial work under mass-production conditions; his sense of exactitude would be outraged.

Comment upon the controller's organization, as shown in the chart.

Do you agree with the remarks made about works accountants as compared with general accountants?

4. Norwalk Paper Box Company

COST DEPARTMENT: HOW SHOULD A COST DEPARTMENT BE ORGANIZED?

Over a period of 75 years the organization of the Norwalk Paper Box Company had grown from a small group of 10 people who participated in all operations to an organization of several hundred people, each person specializing on a particular operation. In the early years no attention had been given to accounting, as a part of production control, because good personal supervision was possible and seemed to be all that was necessary. As the organization continued to grow, however, personal supervision became more difficult and less effective, because of the growing division of labor, and it appeared obvious that some dependence would have to be placed upon accounting reports. Whereas in the early life of the company there had been but one department performing all the processes in a small frame building, there were now four departments in a large two-story building which covered several acres of land.

Like most organizations where the pressure for more accounting becomes pronounced, the company assigned to perform the new accounting functions those men who happened to be available at the time. The outcome of this method of growth was that the cost accounting work was developed haphazardly; there were three divisions of it, each being performed in a different place under the guidance of a different person. The setting of standards became the function of the cost department proper, charges and credits to factory accounts were made in the central office, and job tickets were filled in at the divisional offices under the direction of the division superintendents; all three types of work came under the general supervision of the works department.[1]

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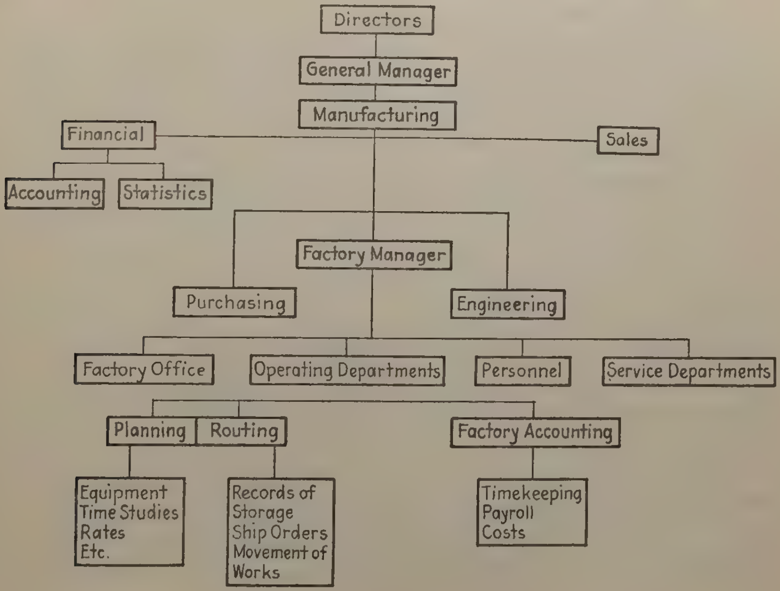
[1] In some other companies a similar division of authority was known to exist. In the Manson Manufacturing Company, the auditor had functional supervision of all cost work. He was equal in rank to the treasurer and general works manager and acted generally as a controller. For disciplinary purposes, the clerks in the operating departments were responsible to the works superintendent, but all methods used were dictated by the auditor. The same situation was apparent in several other plants.

In the Collston Electric Company the cost department was responsible to the treasurer for method, although the performance of the clerical detail was under the supervision of the works department.

In the Davenport Company the organization was as shown in the diagram below.


Directors
General Manager
Manufacturing
Financial
Sales
Accounting
Statistics
Factory Manager
Purchasing
Engineering
Factory Office
Operating Departments
Personnel
Service Departments
Planning
Routing
Factory Accounting
Equipment
Time Studies
Rates
Etc.
Records of
Storage
Ship Orders
Movement of
Works
Timekeeping
Payroll
Costs

As the accounting work grew more disconnected, it became more apparent to the management that the organization layout relative to the cost department was unsound. The division superintendents would, from time to time manipulate the figures relating to their own division in order to make the most favorable showing. This tendency was particularly noticeable in the setting of standards; division superintendents sought to have each standard time set as high as possible, so that its attainment would be easy. In addition to the manipulation a large amount of work was duplicated in the various divisions; the cost accountant might discover, for example, that certain standards were in error and proceed to reset them, only to find upon completion of his work that a divisional superintendent had, through his cost accounting staff, been correcting the same error. Then again, the cost accountant might collect data for rate setting purposes and discover later that a division superintendent during the same time had been collecting performance records, which meant that both had been gathering the same data. Duplication in one form or another became so great at times that as many as three or even four individuals might be performing the same work at the same time.

The defects of the organization became so obvious by 1928 that the general manager decided to make a thorough study of the situation, with a view to rearranging the organization so that it might function more efficiently and smoothly. Since the treasurer was responsible for the preparation of an accurate balance sheet and income statement, it was suggested that he be allowed to prescribe the method of gathering cost figures which affected the important balance sheet item of inventories. The close connection between planning, routing, and costs, on the other hand, made it advisable to continue these functions under the supervision of the works department, with the slight alteration that the cost clerks, for disciplinary purposes, might be made responsible to the foremen. To eliminate the duplication of effort and clarify the indistinct lines of responsibility, it was suggested that the best plan would be to unify the cost accounting under a single executive who should supervise method, rate setting, and clerical detail. The most logical executive for this position seemed to be the chief statistician, since he was responsible to the treasurer but was employed by the works department. It was the opinion of the general manager that by making the chief statistician responsible, his independent position would afford an unbiased check upon the performance of the works department, and at the same time would give the treasurer the information he desired, while leaving most of his time for the administration of financial matters.

Do you think the chief statistician was the logical person to take charge of the cost accounting work?

Would the statistician's relation with the treasurer and the works department tend to cause friction?

Was it lack of cooperation between the various divisions under the old plan or the inherent lack of unity that caused the difficulty here?

5. Colonial Manufacturing Company

PLANT ACCOUNTANT: SHOULD THE PLANT ACCOUNTANT BE LOCATED AT THE HOME OFFICE OR AT THE MANUFACTURING PLANT?

The problem of obtaining correct facts relative to the various plant accounts was a difficult one with the Colonial Manufacturing Company. This was brought about primarily by the size of the organization, there being a home office which controlled 40 manufacturing plants scattered throughout many states. The accounting work had been centralized in the home office, complete and detailed plant ledgers in the form of cards being kept there for each plant. In many instances there were as many as 2,000 cards for a single plant, each card carrying a complete description of the section of the plant it recorded, the additions and subtractions from the assets, the rate of depreciation, and the accumulated total standing in the Reserve for Depreciation account. Practically all of this information had to be supplied by a cost clerk who was located at the particular plant, for the home office did not always know of changes that were being effected in the various plants until after the work had been done.

The cost clerks were not particularly interested in plant accounting, regarding that phase rather as a financial problem; and since their chief interest was in cost operations, the reports which were sent to the home office which contained facts pertaining to the plant often varied in content according to the views of the clerk who made them up. This meant that there was little standardization in these reports as between plants, a circumstance which, if it applied to only three or four plants, would not have been difficult to handle, but, when multiplied to the extent of 40 plants, caused considerable accounting difficulty in the home office. Millions of dollars were invested in fixed plant; an accumulation of variations of small amount on each plant would total to a very large sum in the home office record.

In the home office the accounting organization was controlled by a vice-president controller, assisted by one assistant controller in charge of finance, and another in charge of costs and statistics. The latter assistant controller supervised and was responsible for the work done on the plant ledgers, and he was greatly interested in smoothing out the difficulties involved in this division of his work. In order to standardize the practice and procedure of the cost clerks at the various plants, he had a comprehensive manual of accounting worked out, with a special section on plant accounting, from which it was possible for a cost clerk to tell approximately how any work on the plant should be accounted for. But in spite of this, many reports had continued to come through to the home office with items charged according to a cost clerk's own ideas than in accordance with the suggestions made in the manual. Every time such a report came through, delay was experienced in the home office; for a check up by correspondence and a search through the files for the particular work authorization was necessary to ascertain whether the variation in practice was warranted in the particular case. There was another aspect of the problem which complicated matters. The cost clerks at the plants were engaged by the respective plant executives or general managers, and not by the home office. Obviously, they would, in their recording, and writing up of reports, follow that practice which would place their immediate superior and their plant in the most favorable light.

Although the manual of accounting had helped to rectify this condition, the assistant controller in charge of costs and statistics was not satisfied. He had been contemplating for some time making a change in the organization, whereby plant accountants employed by himself and trained in the home office could be sent to the various plants; they would know exactly how things were to be done, and would be responsible to the home office and not to the individual plant executives. This plan would have the advantage of permitting all of the detailed plant ledger cards to be kept at the plants, and the home office would be relieved of that detail work. There was one consideration, however, which caused the assistant controller to hesitate about making this change; he feared that plant accountants sent out from the home office might be looked upon as spies by the various managers and workmen of the different plants. Further than that, if by any chance the plant accountant did not fit in well personally with men with whom he would associate in the plant to which he was sent, his presence there would be a constant source of friction. Although his ideas for plant accounting on this new basis appeared sound and reasonable, the assistant controller questioned its successful practical application.

If you were in the assistant controller's position, would you have sent a plant accountant trained at the home office to each plant or would you have continued on the old basis?

Could the assistant controller have made any other change which might have rectified the difficulty?

6. Barnes Manufacturing Company

COST DEPARTMENT: WHAT ARE THE ADVANTAGES AND DISADVANTAGES OF CENTRALIZING THE WORK OF THE COST DEPARTMENT?

In the Barnes Manufacturing Company, a large producer of metal products of all sorts, discussion took place as to the most effective organization of the cost department. Eventually a committee was appointed to study this question, and the following was the condensed form of their report.

REPORT OF COMMITTEE ON CENTRALIZING OF COST DEPARTMENTS

ADVANTAGES OF CENTRALIZATION

1. *Reduced Payroll.*—It is assumed that in some of the smaller departmental cost groups, there is often insufficient volume of work to fully occupy even a skeleton cost organization.

2. *Flexibility of Force.*—Sickness, vacations, and other necessary absences create embarrassment in a small departmental group which would not be so strongly felt in a centralized department where the work of the missing person could be readily placed in the hands of other people already trained in the fundamentals.

3. *Reduces Duplication of Records.*—Under a departmental set-up the feeder department cost data must be carried not only in the feeder departments, but in the files of the interested assembly departments as well. There is also considerable duplication of manufacturing information, whereas in a centralized department one file of cost and manufacturing information would be sufficient.

4. *Greater Possibility for Introduction of Labor-saving Devices.*—The volume of work in some of the smaller departments does not justify the investment in the more up-to-date types of office machinery, and in many departments where such investment is made, the comptometers, adding machines, tabulating machines, etc., are occupied only a part of the time, while in a centralized department, the investment in such machinery could be kept more closely in line with the total demand.

5. *Would Speed Up the Work of Cost Estimating for Negotiations.*—Assembly cost departments are frequently obliged to secure some of their information from the separately organized feeder departments, much of which communication is conducted by mail, while in a centralized department, the various details of an estimate could be more actively followed up.

6. *Fresher Cost Information Would Be Available for Negotiation Costs.*—An assembly cost department in making up a negotiation cost must often to save time depend on its own files of feeder cost information, though in the feeder department itself there may exist later cost revisions of many of the parts.

7. *Better Working Conditions and Hours.*—Cost groups located in manufacturing departments must often work under conditions much inferior to those which are usually possible in a centralized department located in a regular office building. Much of the clerical work of the manufacturing department necessitates the clerks observing the same hours as the workmen and the placing of a departmental cost group on shorter hours sometimes raises embarrassing questions.

8. *Contacts Between Cost Department and Operating Departments.*—A centralized cost department places the cost personnel and cost

information in close touch with the engineering, sales general accounting, and executive personnel.

DISADVANTAGES

1. *Cost Men Less Practical.*—The physical removal of cost men from close contact with the apparatus manufactured makes them much more dependent on the accuracy of manufacturing information and other records and induces a clerical approach to a job which can be best handled only as the cost man remains thoroughly familiar with the apparatus itself and the constantly changing conditions surrounding its manufacture.

2. *Loss of Contact between Cost and Rate Men.*—Rate men must of necessity be located in the manufacturing departments. The cost man is very dependent on rate men for labor-cost estimates on all new work and this contact will be surrounded with added difficulties as they are physically separated.

3. *Cost Department Records No Longer Conveniently Available to the Rate Men.*—Rate men are dependent on workmen's performance data available in the cost department not so much for the setting of time limits as for the settlement of questions arising in connection with limits already set.

4. *Added Difficulty in Training New Clerks.*—Training of a new cost clerk is considerably accelerated when, because departmentally located, he can make frequent reference to the manufactured product itself rather than to drawings and lengthy manufacturing information. The sight of the apparatus makes much more readily understandable such references as he must make to drawings and manufacturing information.

5. *Necessary to Provide Better Grade of Time Clerks.*—Some classes of information, such as detail efficiencies of workmen, etc., which must be kept readily available to the department foreman can be conveniently handled by a departmental cost group, but with costs centralized, this work must be turned over to the shop timekeepers.

6. *Danger of Destroying Superintendent's Interest in Costs.*—When departmentally located the cost men and local shop supervisors gain an acquaintance and personal contact which makes it easy for the shop men to keep in close touch with the information available in the cost department and use same freely, but this use of the information is greatly diminished when under a centralized cost department there is no longer the personal acquaintance and contact can be made only at considerable inconvenience.

7. *Reductions in Cost Accuracy and in the Ability of the Cost Department to Assist in Supervision of Expense.*—With the rapid changes in shop practice as well as the continuous minor changes in apparatus design, it is very difficult to keep manufacturing information, etc., closely in touch with these changes. In a centralized department the

clerks are almost entirely dependent on records, while under a departmental cost organization, their personal knowledge of conditions assists them in avoiding many grave errors. Likewise, many items of unnecessary expense can be recognized only through personal contact with the department.

8. *Restricts Outlook.*—When departmentally located, the chief cost clerks can easily become valuable advisors to the superintendents, but under a centralized cost department their work takes on more of a clerical and less of a managerial character.

In the light of the arguments presented, would you recommend a centralization of the work of the department?

7. WIMPLETON TIRE COMPANY

ACCOUNTING MANUAL: WHAT USE CAN BE MADE OF A MANUAL IN ACCOUNTING WORK?

THE PROBLEM

Over a period of 25 years the Wimpleton Tire Company had grown from a small concern to a large consolidation with many subsidiaries, some of which were production companies while others were branch selling stores. The company in its various plants handled crude rubber and fabrics from which it produced tires, hose, footwear, and sundry rubber products; there were some 200 different products in all. A home office, where the major executives resided, controlled the various subsidiaries and dictated all financial and operating policies.

As the concern had developed, the acounting work had become more elaborate and intricate. The treasurer, who was a major executive, had been of the opinion that centralized accounting control was the only sound procedure when an organization became as large and when all policies were dictated from the home office. He had endeavored, therefore, as each new plant had been acquired, to transfer its accounting work to the central office; in every case the manufacturing companies had acceded to the request, but the branch stores refused to shift their accounting work from their own office to the home office. This condition had complicated the accounting work considerably.

No two selling branches had quite the same accounting system and when these branches were acquired and continued their former practice of accounting, the multiplicity of variations in reporting became tremendous and unintelligible to the treasurer. In order to develop a common understanding and uniformity in practice, a chart of accounts was prepared, with the hope that if each branch adopted it the content of the reports submitted to the executive offices would become standardized and consistent.

CHART OF ACCOUNTS

The chart of accounts was constructed on a decimal classification plan, with 10 main groups or classes, designated by the numbers 1 to 0, the numbers and group titles being indicative of the manner and the order in which assets, liabilities, etc., should be stated on the balance sheet. Each of the general classes was subdivided—as 11 to 19; 21 to 29, etc.—the accounts in each class being those comprised in the customary monthly balance sheets and statements of earnings. As many new accounts as were necessary under each classification could be opened upon approval of the treasurer's department by adding additional decimals, such as 11.1, 11.2, etc. The accounts in the general ledger of each subsidiary company were arranged in numerical order, the number always constituting a part of the account title. The chart was divided into four divisions: Assets, Accounts 11–59; Liabilities, Accounts 61–79; Income and Expense, Accounts 81–99; and Clearing, Accounts 01.–09. An idea of the chart can be obtained from the following skeleton in which only the chief classifications, with the first and last sub-classes, are given.

Assets, Accounts 11–59

1—Cash and Receivables
    11. Cash
        .1 Cash in Bank
            etc.
    12. Accounts Receivable

* * * * *

    19. Loans Receivable

- 2—Finished Goods, Goods in Process, Materials, and Supplies
    - 21. Finished Goods on Hand (Own Make)

* * * * *

    - 29. Miscellaneous Goods in Process
        - .1 Material
        - .2 Labor
        - .3 Burden

- 3—Prepaid, Deferred, and Miscellaneous Assets
    - 31.

* * * * *

    - 39. Miscellaneous Deferred Charges
        - .1 Unliquidated Development
        - .11 Labor
            - etc.

- 4—Properties and Plant
    - 42. Land, Buildings, Machinery and Equipment

* * * * *

    - 49. Real Estate (Other than Business Property)

- 5—Securities, Goodwill, Patents, and Trade-marks
    - 51. Stock of Subsidiary Companies

* * * * *

    - 59. Goodwill, Patents, Trade-marks, and Trade Names

Liabilities, Accounts 61–79

- 6—Current Liabilities
    - 61. Accounts Payable
        - .1 Accounts Payable (Outside)
            - etc.

* * * * *

    - 69. Accrued Current Liabilities
        - .1 Accrued Interest
            - etc.

- 7—Fixed Liabilities, Capital Stock, Surplus
    - 71. Bonds of Wimpleton Tire Company

* * * * *

    - 79. Undivided Profits

Income and Expenses, Accounts 81–99
- 8—Income and Expenses on Sales
  - 81. Sales (Own Product)

* * * * *

  - 83. Cost of Sales (Own Product)

* * * * *

  - 87. Selling Expenses
    - .1 Salaries General—(Direct)
      etc.

* * * * *

  - 88. Bad Debts
- 9—Other Income and Expense
  - 91. Cash Discount on Purchases

* * * * *

  - 97. Profit and Loss
  - 98. Provision for Income Taxes (Federal)
  - 99. Dividends Paid

Clearing, Accounts 01.–09.
- 0—Operating and Clearing Accounts
  - 01. Materials Consumed
  - 02. Direct Labor
    - .1 Direct Piece Labor
      etc.
  - 03. Factory Expenses (Salaries and Wages)
    - .1 Supervision
    - .11 Salaries, Executives
      etc.
  - 04. Factory Expenses (Other than Salaries and Wages)
  - 05. Cost of Finished Goods Produced
  - 06. Cost Variation Accounts
    - .1 Cost Variation—Raw Materials
      etc.
  - 07. Property Clearing Account
    - .1 Labor
      etc.
  - 08. Automobile and Truck Clearing Account
    - .1 Labor
      etc.
  - 09. Miscellaneous Clearing Account
    - .1 Cartons and Cases Clearing Account

* * * * *

    - .9 Miscellaneous

After this complete chart of accounts was worked out and mailed to the various branches, however, only small improvement was noticed in the reports from branches generally. It was the opinion of some of the executives that the chart of accounts by itself was unintelligible to the branch stores' accountants; rather than try to puzzle out which account number should be used for certain postings they would post a particular transaction as they had always posted it. Thus, with the situation still unsatisfactory, the treasurer considered going a step further by constructing a manual of accounting which would have the chart of accounts as a base but would include also an explanation of it and serve as a general instructive bulletin on the company's accounting. It was realized that several years would be necessary to develop the use of such a document, that a great amount of time would have to be spent on it, and that the cost would total a considerable sum of money; further than that, after completion the manual would still have to be kept up to date or it would be of no value. The treasurer decided that the manual would be worth its cost and assigned to the assistant controller the responsibility for developing it.

MANUAL OF ACCOUNTING

The assistant controller worked up a Manual of approximately 400 pages, containing 11 divisions.

I—Chart of Accounts
II—Assets, Accounts 11–59
III—Liabilities, Accounts 61–79
IV—Income and Expense, Accounts 81–99
V—Clearing, Accounts 01.–09.
VI—Accounting, Instructions (General)
VII—Accounting, Instructions (Footwear)
VIII—Accounting Instructions (Mechanical)
IX—Accounting Instructions (Tire)
X—Accounting Procedure (Plant)
XI—Accounting Instructions (Plant)

I. CHART OF ACCOUNTS

The "Chart of Accounts" section was merely a copy of the original chart as it had been developed and revised. It was included in the manual to make the latter complete and to make the relationship between the manual and the chart of accounts obvious.

II. ASSETS, ACCOUNTS, 11–59

The Asset division, which began with "1—Cash and Receivables 11. Cash" contained a detailed description of each asset account listed in the chart of accounts and explained how and on what occasions the account was to be used. In order to make it clear what was contained in each division, the explanation on Cash—Account No. 11 and one of its subdivisions are given below:

11. Cash

The asset "Cash" consists of actual money, of checks redeemable in money at a bank, and balances due from banks, payable in money on demand.

This asset is subdivided, for the purpose of practical accounting control, into the Cash Account Classification as hereinafter described:

.1 Cash in Banks

This is a summary account the balance of which represents the total balance due from banks, subject to withdrawals by check. This account is charged with the total amount of bank deposits made during the month, and is credited with the total checks drawn during the month, these postings being made from summary entry made at the close of each month. The balance remaining in this account at the close of each month represents the total amount on deposit in banks as of the respective dates. If deposits are made in more than one bank, provision is made accordingly in the Cash Book for recording separately deposits made, checks drawn, and the net balance on deposit with respect to each bank. All cash receipts are deposited, and all cash disbursements are covered by checks drawn; therefore the Cash Book balance is at all times in agreement with the total of all bank balances, and at the close of each month coincides with the balance of this account.

A reconciliation of each bank balance is made monthly with the respective statements furnished by the banks. After duly recording all incidental items covering interest, collection charges, or other items appearing on the bank statements, and taking into consideration the amount of outstanding checks, the bank

> balance, as shown in the Cash Book, should agree with the respective balance indicated on the bank statements.
>
> For detailed explanation of Cash Reports, see Accounting Instructions (General) G–C–2.
>
> For detailed explanation of Standard General Cash Book, see Accounting Instructions (General) G–C–3.

The next item was .2 Petty Cash in Cashier's Office, and so on, until the last account, 59. Goodwill, Patents, and Trademarks; each item under the "Asset" caption was taken up and described as fully as the "Cash in Banks" division given above.

III. LIABILITIES, ACCOUNTS 61–79

The "Liability" section covered the accounts beginning with No. 61—Accounts Payable.

> 61. Accounts Payable
>
> This liability as shown on the balance sheet consists of Accounts Payable (other than Allied Companies) and is subdivided in the General Ledger to distinguish the classes of indebtedness incurred, which remain unpaid at the end of the month.
>
> .1 Accounts Payable (Outside)
>
> This account is used to control the balances of the accounts of creditors (other than employees or allied companies). It is credited at the end of the month with the amount of invoices recorded for payment through the Accounts Payable records, and charged from the summary Cash Book entry with the total of all payments made for such accounts. The balance remaining represents the unpaid balances of creditors' accounts.
>
> For detailed procedure to record Accounts Payable, see Accounting Instructions (General) G–C–1.

This section ended with a detailed description of account No. 79.—Undivided Profits.

IV. INCOME AND EXPENSES, ACCOUNTS 81–99

The "Income and Expense" section, including Other Income and Expenses, considered a number of accounts, the first being Account No. 81—Sales (Own Product).

81. Sales (Own Product)

This account is credited with the gross amount of Sales of Manufactured Goods (Own Product) to customers, the contra entry being a charge to Account 12.1 Customers' Accounts.

Goods returned by customers are charged to this account, and entries are made to cover price adjustments, merchandise allowances, etc.

All sales of merchandise (Own Product) to employees are also recorded in this account.

The balance of this account represents the net sales of own product and is indicated on the Statement of Earnings each month.

A similar description was given of all the other accounts in this section ending with account No. 99.—Dividends Paid.

V. CLEARING, ACCOUNTS 01.–09.

The "Clearing Account" section covered all accounts from 01. to 09. and each of the accounts was described in the same manner as illustrated above. Under 03. Factory Expenses (Salaries and Wages) was the following description.

.1 Supervision

.11 Salaries, Executives

Salaries of president, vice-president, treasurer, secretary, assistant treasurer, assistant secretary, managing director, factory manager, also superintendent (when acting as factory manager permanently); and the proper portion of salaries of other directing officials or individuals acting in that capacity.

This account does not include salaries of an employee acting as a secretary or an assistant to one of the above. Such salaries are charged to account 03.29—Salaries, General.

VI. ACCOUNTING INSTRUCTIONS (GENERAL)

This section covered a miscellaneous group of items, such as, Automobile Insurance Premiums, Billing of Scrap Rubber, the Centralization of Cash and Payment of Factory Invoices at Home Office, Cash Reports number G—C—2 and Cash Book number G—C—3, which two covered the detail that was referred to above under .1 Cash in Banks, Cash Budget, Correspondence, Containers—Bags—etc.—Returned, Group Life Insurance Plan

Accounting Procedure, Inter-Company Settlement Note Procedure, Journal and Journal Vouchers, Power Costs Procedure, Register of Prepaid and Accrued Items, Sales Authorized by the General Purchasing Agent, Transfers from Canadian Allied Companies to U. S. Allied or vice versa, Transfers of Raw Materials and Supplies, and Wage Check System.

VII. ACCOUNTING INSTRUCTIONS (FOOTWEAR)

The Accounting Instructions (Footwear) covered in detail the following items: Account Classification No. 29—Miscellaneous Goods in Process, the Centralization of Cash and Payment of Factory Invoices at New York, Cartons and Cases, Consumption Prices for Materials and Supplies, Finished Goods (Waterproof and Keds) Overhead Distribution, Returned Goods (Waterproof Footwear) Salvage Sales, Factory Salesroom Shipments to Employees of Wimpleton Tire Company (Home Office), and Resited Machine Royalties.

VIII. ACCOUNTING INSTRUCTIONS (MECHANICAL)

The Accounting Instructions (Mechanical) contained a description of these topics: Consumption Price for Materials and Supplies, Claims—Branch Stores, Claims—Allowed for Damaged and Defective Goods and Salable Goods Returned and Packing and Shipping Expense; the content of the latter was as follows:

PACKING AND SHIPPING EXPENSE

> Packing and Shipping Expense chargeable to account 03.84—Packing and Shipping Labor and account 04.84—Packing and Shipping Expense, are included as an element of cost, known as "Casing and Baling."
>
> In preparing form No. 34—E.M.—Analysis of Factory Expense, Accounts 03.84—Packing and Shipping Labor, and 04.84—Packing and Shipping Expense, are treated in the same manner as account 04.463—Depreciation of Plant, i.e., such expenses are omitted from Sheets No. 2 and No. 3 of this form and reported as separate items on Sheet No. 1 (Summary) only, and on the two lines directly above the item "Depreciation of Plant." The total Packing and Shipping Expense is, therefore, not included in the "Grand Total of Factory Expenses," but is indicated as separate items making up the "Total Cost of Production."

IX. ACCOUNTING INSTRUCTIONS (TIRE)

The division on Accounting Instructions (Tire) covered the centralization of Cash and Payment of Factory Invoices at Home Office, Consumption Prices for Materials and Supplies, Damaged, Defective and Replaced Goods Returned, Losses or Gains on Finished Goods Scrapped or Lost in Transit, Gross Prices (New) and Salvage Sales.

X. ACCOUNTING PROCEDURE (PLANT)

This division contained a detailed explanation of such topics as, Appraisals, Plant and Construction Accounts, Monthly Reports Required, Request for Plant Expenditure, Controlling Plant Expenditures, Plant Orders, Additions to Plant, Authority to Post, Recording Expenditures on Plant Orders, Definition of Terms, A List of Standard Plant Numbers, Standard Classification of Plant and Equipment, Standard Sub-Classification of Plant and Equipment, Detailed Description of Standard Sub-Classification of Plant and Equipment, and Use of Forms.

XI. ACCOUNTING INSTRUCTIONS (PLANT)

The last section covered Plant Accounting Instructions and described such items as, Duties of Plant Accountants, Automobiles and Trucks, Clearance and Control of Plant Orders in Process, Dismantling or Demolishing Property and Plant Items, Equipment Expenditures, Extraordinary Experiments and Developments, Fire Losses, Losses (Footwear Factories), Molds and Forms (Mechanical Goods Factories), Molds and Cores (Tire Factories), Office Furniture and Fixtures, Real Estate Purchases (Of Land, Buildings or Both), Replacements, Sales of Equipment (Outside) and Transfers (within Plants and between Plants).

When any revision took place in the manual, new sheets were made up, properly numbered and mailed to the various plant executives who held the manuals. The receivers of the sheets had to sign a receipt for the new sheet and return the old sheet. Then about once a year a follow-up letter was sent from the home office to make sure that the new sheets had been properly inserted in all manuals rather than laid aside to be taken care of later. All manuals were given out on a loan basis so that each person receiving one was responsible for it and for returning it upon demand from the home office.

RESULTS

After the manual was sent to all subsidiary company executives who were compelled to use it in conjunction with the chart of accounts, a noticeable improvement resulted in the written reports. Variations, however, still occurred from time to time, but the treasurer decided that such a condition would always exist until the home office itself engaged, trained, and directly controlled the accountants who took care of the branch store books. The treasurer thought the latter possibility ideal from his viewpoint so far as standardization of recording was concerned, but there was considerable doubt in his mind about its practical introduction and accomplishment. Consequently, he took no steps to correct the situation beyond the supplying of each responsible person in the organization with a manual with the request that it be strictly adhered to.

Would it be necessary in every case to have a manual of accounting to make a chart of accounts intelligible?

Since the manual of accounting did not eliminate entirely the difficulty that existed under the chart of accounts, do you believe the treasurer made a mistake in having it drawn up?

To what extent would you say a detailed description should be carried in a manual of accounting?

Would a manual of accounting constructed around "flow of work" be more or less satisfactory than one based upon account topics as here described?

8. Morrell Shipbuilding Company

MATERIAL CONTROL MANUAL: TO WHAT EXTENT DOES A MATERIAL CONTROL MANUAL AID IN THE ESTABLISHMENT OF A MATERIAL CONTROL SYSTEM?

The Morrell Shipbuilding Company, a pioneer in its type of industry, had grown over a period of years from an enterprise of small proportions to a leader in the field. The business was by its nature one in which orders were received by bid and contract. The company, as it was originally formed, was a closely organized one and had remained so until recently. During its growth, the company had followed the practice of promoting various men in the concern to the several executive positions that became vacant from time to time; this practice had been followed both as to major and minor positions.

During the World War the company, like all others in the industry, was overloaded with work and many new positions were created and many new men hired. At the same time, members of the original organization who had started the company released the active management of its affairs. As they vacated their positions, several executive positions were filled by outside men. One of these, who became production manager, had had considerable experience in shipbuilding and other industries. After making a complete survey of the company, the production facilities of which he was to have charge, he decided to revamp and revise the cost and production systems. Because of the huge volume and variety of materials purchased and handled he decided to study and revise the system of handling and accounting for materials first.

The control of material, in spite of the fact that it had become a tremendous department, had depended mostly upon personal knowledge of the men within the department. Although some attempt had been made at establishing a perpetual inventory system and general stores control, it had not worked successfully because it was not promptly posted or systematically operated. The production manager, in order to develop a satisfactory system, decided to incorporate all of the important elements of material control in a manual which could be published and circulated among the employees handling the materials.

The manual as developed for this purpose was divided into nine sections as follows:

1. Scheduling
2. Material Control System
3. Manufacturing and Yard Orders
4. Procurement of Materials
5. Material Distribution System
6. Drawing and Piece Marking System
7. Appendix A—Material Classes
8. Appendix B—Standard Group Numbering System
9. General Index

Each section was in general composed of two parts, first, a few pages of text material which explained in detail the subject being covered, and second, a complete series of forms and plates which illustrated the explanatory matter preceding it.

1. SCHEDULING

The first division of the manual explained the procedure followed in developing the master schedule and showed how it was broken down into the detail schedules necessary for controlling the progress of productive work.

Upon the receipt of a contract, the first step was to make up a tentative schedule of the principal events in the construction of a ship from the data available, which consisted of such information as contract plans, bidding specifications, and the preliminary dates that had been set when the tender for the job had been submitted. This schedule was sent to all departments concerned for their approval, after which it was used as the basis for the development of the master schedule.

There were three main divisions of the organization, which worked on the construction of a vessel. To the first of these, the Hull Assembly division, the approved preliminary schedule was submitted, and it proceeded to make up the master schedule for the work to be done under its supervision. This was accomplished by setting the starting and completion dates for the erection of different classes of material which it handled. These classes of material corresponded to the general divisions into which the construction work was divided.

When the Hull Assembly division had determined the time it required to do the work over which it had control, it notified the two other erection divisions, the Hull Outfitting division and the Machinery Erection division, of the dates that it expected to complete different locations or "stations" in the ship, sufficiently so that other work might be done. On the basis of the information thus furnished them the other divisions made up the master schedule for the work they had to do.

When this part of the master schedule had been completed, the next step was to schedule the sub-assembly and erection work. The dates for doing this work were set by referring to the master schedule and determining when the material was required for the final assembly. Working back from the sub-assembly, the next job was to arrange the work to be done in the shops so that the parts would be completed by the time they were required for the next operation. The final step in the completion of the master schedule was the setting of dates by which the raw material and parts should be received at the plant in order to be on hand when needed and the determination of the dates on which they should be ordered. The completed schedule was made up in graphical form in addition to the detailed draft and was then approved as a whole by the committee in charge of material affairs.

The drafting offices made up tentative lists of plans which they expected to issue to cover the work at the same time that the schedule for obtaining the material was drawn up. These plans were arranged to correspond as nearly as possible to the divisions of the work used in the master schedule in order to facilitate the setting of dates that would tie in with that record. This list was checked jointly by the drafting departments and the operating divisions to determine the earliest date any plan would be required, and the drawings were scheduled for completion accordingly.

After the approval of the master schedule the erection divisions proceeded to make out detailed schedules for doing their work. The production unit used in controlling the erection work was known as the "group," and it denoted a definite amount of material that was to be installed or erected as a unit at one time. The entire assembly work was, therefore, organized by scheduling all the different "groups" which made up the ship, and a record developed in this way was known as the Material Control Erection Group Index. As this work was closely related to the material control procedure it was discussed more fully in the next section.

Following the completion of the detailed group schedules a number of diagrams were drawn up which showed the interrelation and sequence of the work as carried out by the different departments. These records enabled the different parts of the organization to correlate their efforts and eliminated a lot of confusion and misunderstanding during the actual construction of the ship. If, at any time, delays were encountered on some part of the job, reference to the diagrams indicated at once all other parts of the work that would be affected. Further, revision of the schedules was often necessary because of changes in contract plans, delivery dates, or methods of doing the work. Such changes necessitated a complete checking or revision of all the schedules subsequent to and dependent on the one changed which were indicated by the diagrams made up.

Progress on a job was reported bi-weekly by the various departments and from the information thus furnished a delinquent elements report was made up, which gave for each major type of work to be done the relation between the amount completed to date and the schedule which had been adopted. Supplementary to this information a Master Schedule Progress chart was drawn up which had plotted, on a time base, curves showing the scheduled progress of the major portions of work. As the work on the contract was carried forward, the actual performance obtained was also plotted on the same chart, which gave a visual comparison of the progress being made on the whole job.

For repair or rush work special diagrammatic interdepartmental schedules were made up which showed in general the work to be done each day so that the job might be completed within the allotted time. If sufficient time was available to study the job thoroughly at first, a complete schedule of the work to be done giving all details was made up in written report form.

2. MATERIAL CONTROL SYSTEM

To quote from the manual, "The object of the Material Control System is to facilitate delivering material, ready for erection, to the men doing the erection, in quantities which can be worked most efficiently by them and at such a time as to allow the work of erection to proceed in accordance with predetermineed dates."

This division of the manual described the way in which the work was finally broken down into groups, and the way in which the material required for the groups was determined, recorded, checked, and controlled.

The designation of the detailed erection groups was done by representatives of the departments doing the erection or installation work. As the detailed plans were developed in the drafting offices, they were studied in conjunction with the contract specifications and the master schedule, and the erection groups determined, which, when listed in order, made up the Material Control Erection Group Index. This list was the governing record which stipulated the work to be done on the vessel and arranged the jobs in their proper sequence. In determining the size and content of a group, such considerations as the handling and storage of the material necessary, interference with other work being carried on, and the number of men required to do the job were taken into consideration.

As most ships had, in general, the same classes of work to be done, the management endeavored to use standard erection group numbers for the different types of construction, subdivisions of the general group numbers being used to meet the requirements of particular jobs.

When the erection groups had been determined, the next step was to make up the Erection Material lists, which were separate records of the parts used to make up each group. This work was done by men under the engineering departments who had had experience on similar erection and installation jobs. In addition, however, they checked with the men in the erection departments, to be sure that the lists would be absolutely correct when issued. These lists were then forwarded to the order department where prints were made which were distributed to all departments in the plant having anything to do with the work required. As the erection lists often were not finished until work on some of the parts had been done in the shop, the foremen had to keep a record of all jobs that had been processed and check off such as had been completed when the lists were received.

The materials used in the plant were divided into three classes for purposes of checking and controlling them through the processes. They were known as Class A, Class B, and Class C, and denoted respectively raw material, material that had been or was being worked by some department in the shop, and material that had been obtained from outside sources ready for erection.

These classifications of material were used in making up a controlling record known as the Material Control Report No. 1. This report showed for each erection group the detailed schedule for the receipt of the raw material, the dates by which the shop work on it should be completed by the different departments in the plant, and the scheduled dates for the receipt of Class C material. Blueprints of this form were sent out weekly to all departments connected with the work, and they filled in the actual completion dates of the events scheduled as they took place. The prints were then returned to the material control department and the master record brought up to date.

In conjunction with the report just described a Delinquent report was made up which detailed the groups that were late, any that were expected to be late and the department in which they were delayed. These reports indicated where special efforts should be applied in order to keep the work up to date.

A general Material Control Committee of 10 members, representing all departments, met bi-weekly to discuss all matters pertaining to material which required their consideration. Their chief duties were to approve the master schedule and see that all details were brought into agreement with it, consider all conditions which were delaying the work in progress and take take such steps as were necessary to correct any present or expected difficulties. With particularly bad situations sub-committees were generally appointed to make a complete study of the problems and offer recommendations as to their solution. The minutes of these meetings were used to advise the executives throughout the plant of the general material situation.

3. MANUFACTURING AND YARD MATERIAL ORDERS

Production orders were written on the basis of drawings made up for the work to be done, of which there were three kinds. First, drawings on which all the parts listed were to be manufactured, second, assembly drawings of structural steel work, and third, drawings that listed standard assemblies such as valves and airports for installation purposes.

The drawings were sent to the order department from the drafting offices accompanied by a slip which indicated what prints and production orders were to be issued. All such orders issued were given the drawing number on which they were dependent, thus tying the records together; material tags were also made out to be attached to the work as it was going through the shop. Both the production orders and the material tags had written on them the final group numbers for which the material was scheduled.

As a convenient and definite method of indicating work that was urgently required, the production orders and tags for such material were sent out on red forms; white orders and tags were used when the work was to be done in the regular sequence.

All departments in the plant were designated by means of two letter symbols which were used for routing materials through the shop and for indicating the distribution of tags, drawings, and production orders. A list of the departments giving their respective symbols had been made up and was included as a plate in this section.

When a department in the plant wished miscellaneous or repair work done, it filled out a yard order which was sent to the order department wher the production orders necessary to have the job processed were issued. However, if one department was to do the entire job, the original yard order was all that was required. When material was spoiled or lost, a yard replacement order was sent to the order department as a requisition to have new parts made up.

4. PROCUREMENT OF MATERIAL

In the "Procurement of Material" section of the manual the procedure followed in ordering the necessary material from outside sources and the methods by which material could be requisitioned from stock and reserved for the work in the plant was explained.

Requisitions for material to be used on contracts originated in the engineering departments. They were then forwarded to the material department where terms and delivery dates were inserted, after which the purchasing agent placed the order. Three general forms were used in ordering material, the first for miscellaneous material, the second for steel plates, and the third for shapes and bars. Another special form was used to obtain stock from local dealers.

When any offices in the plant unauthorized to write outside requisitions desired material, they sent yard requisitions to the material department, where they were rewritten on standard order forms and forwarded through the regular channels. Requisitions for the purchase of store's material were first made out in the warehouse and then sent to the material department, where they were checked against the Perpetual Inventory records before being ordered.

Requisitions for tools and equipment amounting to not over $50 were written by the foremen, approved by their superintendents, and forwarded to the plant engineer's office for their examination to see that they conformed with standard practice. If approved, they were then handled in the same manner as regular material requisitions. The plant engineer's office originated all orders for plant machinery and equipment costing more than $50, and a plant appropriation having the approval of the general manager's office had to be obtained before such equipment could be purchased.

As a method of keeping the organization informed of the steps that had been taken in obtaining the material required for a contract, copies of the requisitions were distributed to those concerned throughout the plant. These requisitions showed the group numbers to which the material was assigned and the date by which it should be received. Material in stock could be reserved for particular orders by writing out a stock reservation slip, or in some cases marking "Stock" on the erection material lists was all that was required. These stock reservations originated in the engineering departments at the same time material requisitions for a contract were being written. All material reserved in that manner was given the group number to which it was assigned, so that it could be identified for a particular job.

Detailed instructions were given as to the manner in which requisitions for material from the stores should be written, so that the stores department could use to best advantage the stock they had on hand. Items of material which were to be supplied from different disbursement points throughout the plant were to be ordered on separate forms.

Material that was left over from contracts and repair jobs was summarized regularly by the general storeskeeper on a "Left-Over" list. This list grouped all items of like nature, giving a description of the different pieces and the original job numbers for which they had been purchased. Prints of the list were distributed to all departments that might require material, and any parts that could be used for current purposes were requisitioned in the usual manner.

For purposes of general information and to aid in correct scheduling of material orders, a list was given which showed, for the principal types of material used, the length of time required to obtain them after an order had been placed.

5. MATERIAL DISTRIBUTION SYSTEM

To quote from the manual, the object of the system was as follows:

> The Material Distribution System is designed to permit a procedure for handling materials which will minimize the handling costs, prevent materials from being lost or wasted, and most important, will deliver to the men at their work the desired materials at the proper time, thereby eliminating the time wasted in waiting or going to the storeroom for materials.

The first part of this section outlined the routine procedure by which materials were taken care of throughout the plant, such as the details of receiving, storing, transferring between departments, and the divisions of the organization responsible for them under the different conditions. In general, the methods followed were the same as used in regular industrial work.

Following this part of the section, the personnel of the special organization, which had been set up to take care of the material problems, and their duties were explained. In addition to the workers in the storerooms, there were men located at various points or "stops" throughout the yard where the material which had been requisitioned was delivered. It was the duty of these men to take care of all material in the area over which they had control and see that it was properly handled, and accounted for. At each large job a special man was stationed whose duty it was to take complete control of the entire material situation connected with the work and see that no interruptions or delays were caused by material conditions. Another employee, located in a central office, was designated as the "Material Trouble Man" and any difficulties with respect to material handling or delivery throughout the plant were to be reported to him; it was his duty to take such steps as were necessary to correct the situation. These men were all identified by special material badges issued to them by the company.

The routine to be followed in ordering material from the stores was outlined, and the time required to fill different types of requisitions was given. A list of the different storerooms in the plant, giving their location, was included in the manual and was supplemented by a second list which detailed the different kinds of material in stock and showed at which storeroom they could be obtained.

In order to facilitate the distribution of material throughout the plant, regular routes had been laid out for the delivery trucks which made scheduled trips during the day. On these routes certain "stops" were designated at which material was delivered and loaded for delivery at other points. The location number of each stop and the name of the material man in charge were given in a table to aid in the correct handling of stock.

Detailed instructions were given as to the method by which fragile materials should be handled, and the standard types of containers to be used throughout the plant were illustrated. The facilities available for handling heavy objects and the procedure required in order to obtain night service in moving materials were outlined. Instructions regarding shipments of materials and completed work were also written up, and the time generally required to obtain the different types of transportation facilities indicated.

6. DRAWING AND PIECE MARKING SYSTEM

This section contained a description of the symbol system used in marking the drawings and the work passing through the plant. It also explained the different types of drawings made up and the purposes for which they were used.

The regular drawing number consisted of three elements and was written as follows:

236K–67–4

The figures in the first element represented the contract number and the letter indicated the general class of contract which, in this case, was the construction of a new vessel. The second element, 67, classified the type of work shown on the drawing; the construction of a ship having been broken down into some 200 divisions. The last element gave the serial number of the drawing for that class of work, and indicated that it was the fourth drawing put out for class of work number 67.

If a drawing was used for another job the old number was crossed out and a new number in which the contract element had been changed was printed on it; when being used for two contracts at once both numbers were put on the drawing.

Parts being processed through the shop were marked with an item number and the drawing number, thus, (3) 247K—179—12, which indicated that the part was the third item on the twelfth drawing for class of work 179 to be used on contract number 247K. In the case of castings the item and drawing numbers became the pattern numbers. When used for miscellaneous contracts the second element was omitted, as the job was generally of such a nature that the designation of the class of contract as given by the first symbol was sufficient to indicate the work that had to be done. Drawings of standard parts used repeatedly on different jobs were known as "standard" and were given special numbers which were not changed.

The Hull department used three types of drawings, known as detailed plans, assembly plans, and arrangement plans. The first type showed the detailed construction of each item, the second, the assembly of a group of parts together, and the third, their location in the ship assembly.

In addition to the three types of plans listed above, the engineering department used three additional types, known as standard plans, yard requisitions, and material lists. The first of these showed the detailed construction of items such as valves and flanges which were used regularly in construction work. Yard requisitions were lists made up for the required number of parts necessary to do a job and they referred to the detailed plans of such items. Material lists were made up for the plumbing and lighting fixtures necessary to do parts of the work and were printed for the information of the yard. Information was also given as to the interpretation of the conventional symbols and marks used on all drawings.

7. APPENDIX A—MATERIAL CLASSES

This section consisted of two lists and was used in classifying the work to be done and material to be used.

The management was endeavoring to standardize for the different jobs the class numbers for the work to be done and as a means of attaining this end the first list in this section was made up which gave in numerical order the standard divisions and class numbers into which the construction work on a ship had been divided. These class numbers were the ones originally used in making up the master schedule.

The second list detailed in alphabetical order the material and equipment that would be used on a construction job and classified them according to the type of work for which they would be used.

8. APPENDIX B—STANDARD GROUP NUMBERING SYSTEM

This section contained lists of the standard group numbers that had been developed for the Erection division and the Hull Outfitting division. In addition to the erection group numbers the class of material used for each group was given.

The list for the Hull Outfitting division was broken down by classes of work done by different trades and the subclassification for each group were also given.

9. GENERAL INDEX

This section needs no explanation, except to say that the index did not include references to the forms and plates used as illustrations.

Subsequent to the adoption of the material control procedure in the organization, a number of other phases of its operation were studied and improved. The result of these activities was that, after a period of five years, the direct-labor cost of the construction of a vessel had been reduced by 21%, and this saving was directly traceable to the work that had been done on 12 different phases of management. Of the total saving, 4.06% was traceable to the changes made in the material control procedure, which was more than 50% greater than the improvement made in the work done on any of the other lines studied. The results, therefore, of the material control program that had been inaugurated were entirely satisfactory.

To what extent do you think material control manuals could be generally used?

The manual was approximately 200 pages long and cost close to $7,000. Do you think the length and cost were justified?

9. Westcliff Manufacturing Company

INSTALLATION OF A COST AND CONTROL SYSTEM: TO WHAT EXTENT MUST PERSONALITIES BE CONSIDERED WHEN A SYSTEM IS INSTALLED?

The plant of the Westcliff Manufacturing Company was situated in a small town in western Pennsylvania, the head office being at Pittsburgh. The president of the company, the vice-president in charge of sales, the treasurer, the secretary, and the sales and accounting officers were included in the head office organization; at the plant was a vice-president in charge of production and a factory office for handling payrolls, expense vouchers, and all the primary records connected with receiving, storing, and issuing materials and supplies, and making the disbursements involved in manufacturing.

The president was interested primarily in sales, but he also kept in close contact with production; for these purposes he relied upon a few main figures, such as the quantity of raw materials processed, its average unit price, the coal consumed by the power house, the payroll at the plant, and the percentage yield of the different types of meats and by-products resulting from the month's operations. The president relied a good deal upon the chief accountant in connection with the details of office administration, and for any extra items of information which he desired beyond the ordinary monthly reports. He had come up from the sales organization and was little acquainted with accounting procedure; from time to time it occurred to him that, in proportion to the volume of business done, a very large amount of figuring seemed to be done in the accounting department, and that much repetition occurred in the handling of accounting data. At different times he observed signs of this sort of thing in the Sales records and classifications, in the Expense records, in the handling of vouchers, and in the cost distributions; on such occasions he spoke to the chief accountant and asked if some simplification of procedure could not be effected. The latter always assured him that every figure produced in his office was necessary to the welfare of the business; the president was not sufficiently acquainted with accounting, and was too busy with other things, to argue further about the matter.

The chief executives were able to work together harmoniously on all the major questions of policy, especially as regards production and selling. In some matters, however, slight personal preferences or prejudices arose to influence their attitude, the accounting administration being one example of this sort of thing. The chief accountant desired to receive all accounting data from the factory in the most elementary form possible; long statements of materials and supplies consumed, of inventories on hand; of goods produced, of repairs, expenses, of payroll details, of cash disbursements, and of transfers between manufacturing departments, were submitted without any particular arrangement, and with no previous digestion or classification by the factory office. It was the view of the chief accountant that all analysis and classification work should be done at the head office under his immediate supervision, partly because he did not consider the factory office competent to do that type of work, and partly because the process of working up the materials served as an audit of the reports from the factory, and enabled him occasionally to pick up any mistakes in them, which were for the most part of a very minor character. He carried this attitude to the point of believing that the more work was needed to be done in his office upon the reports received from the factory, the more satisfactory they were. Although the president desired in general to reduce the volume of accounting work, and to simplify that department, he was disposed to support his chief accountant in this attitude, and so did the vice-president in charge of sales, because they both held that the control should be vested definitely in the head office, and they considered that this involved doing as much of the accounting work as possible at head office. The vice-president at the plant had from time to time suggested that more of the accounting work might be done at the factory, or that some of the factory reports might be developed a little further, but these suggestions were invariably resisted by the head-office executives, on the grounds already stated. None of the executives knew enough about accounting work to realize that they all might have what they wanted in the way of organization, and division of functions between the head office and factory, and yet that the accounting work might be carried out on a more effective and economical basis.

The feeling that the accounting might be better done, however, gradually grew upon all the executives, until eventually all of them concurred in calling in a consultant to examine the situation and make recommendations. The administrative policies of the company were fully explained to the consultant, and each principal executive frankly expressed his point of view; although these seemed to conflict, the consultant found support in the fact that all of them agreed in believing that the accounting work should be revised.

In the course of his investigations the consultant ascertained all the foregoing facts, and in addition was able to observe the chief accountant's mode of operations. One folder was kept for all the papers relating to the factory accounting for each month, including the original reports from the factory and the summaries and recapitulations prepared from them. From these a series of manufacturing accounts was worked out in a small paper-bound ledger; in these ledgers the balances brought forward from the previous month were copied from the book for that month into the new book for the current month, and then all the transactions of the current month were entered from the recapitulations, and proper transfers were made to correspond with the flow of goods through the factory. When this series of accounts was completed, a summary of them was prepared, the totals of which were posted to certain Process and Product accounts kept in the General Ledger. This procedure the chief accountant regarded as his accounting control over the manufacturing operations. Neither in the General Ledger nor in the small group of monthly Manufacturing accounts were there any primary Expense accounts showing the elementary expenses entering into the cost of manufacture; these were brought into the ledgers only after considerable distribution and redistribution to Process and Product accounts. One result of this was that the preparation of the ordinary form of Operating Statement was impossible; another result was that, when it became necessary to prepare the annual income tax statement, the chief accountant had to reassemble his various expenses out of his Manufacturing records in order to get the items necessary for his return.

To meet these conditions the consulting accountant proposed, among other things:

1. A better coordination of work as between the factory and head office, including especially reports supplied by the factory in such form as to give classifications and totals ready for use by head office.
2. A general overhauling of the accounting, with a more logical list of accounts in both General and Cost ledgers, with a proper accounting control of the latter.
3. The use of tabulating equipment for much of the routine work, especially the Sales records and the handling of vouchers.
4. A few general reports to executives showing the significant facts concerning production, costs, inventories, and the principal expenses.
5. That the chief accountant delegate more of the work to subordinates, who hitherto had had little opportunity to understand much about the general plan of accounting.

These proposals were supported by detailed argument and explanations of the existing conditions which prompted them.

After consideration the directors adopted the report of the consultant in toto; he was accordingly instructed to proceed with the plans as outlined, but with the proviso that he was to maintain friendly relations with the chief accountant, who was regarded by them as a necessary and valuable part of the organization; the new methods were to be described to him in a way which would enlist his confidence and approval; the directors in turn assured the consultant of their support.

As the consultant proceeded with his work it developed that, while the chief accountant was friendly, and showed every desire to cooperate, yet he had so long followed the existing methods that he believed that every figure and every procedure now in use was essential to the welfare of the business; he was unable to see that other methods could give equally reliable results in a straightforward and economical manner. The consultant accordingly took the figures for a recent month and showed in detail how every part of them would be recorded in the first instance, and all the subsequent stages through which the information would pass. In this way the general plan was gradually communicated to the chief accountant in a manner which commended it to him, and after a number of months the new system was brought to the point of satisfactory operation, by which time the chief accountant had become confident of its effectiveness and soundness. The officers of the company, on their part, were quite willing for the consultant to take the time necessary to convince the chief accountant of these things, in order that he might be induced voluntarily to give the new plans his personal support.

What part, if any, do personalities play in the installation or revision of an accounting system?

If a consultant accepts a position, as in this case, when the president wants the system revised but the cost accountant does not cooperate, what should be his mode of procedure?

X

COST CONTROL IN TYPICAL INDUSTRIES

1. Hall Chemical Company

DEPARTMENTAL LEDGER: WHAT ENTRIES ARE NECESSARY TO RECORD A DEPARTMENT'S ACTIVITIES IN ITS LEDGER?

MANUFACTURING PROCESSES

The Hall Chemical Company was engaged in the manufacture of a considerable number of products, most of them being produced in several departments; one of these departments was making commercial alum, known technically as "aluminum sulphate." It was shipped to customers either in bulk by the carload, or packed in 200-pound jute bags. The principal ingredients were two: bauxite, or aluminum oxide, and oil of vitriol, or sulphuric acid, the latter being produced in another department of the plant.

The basic chemical equation was $Al_2O_3 + 3H_2SO_4 = Al_2(SO_4)_3 + 3H_2O$. The bauxite was received in chunks, and was broken into small particles in a grinding machine before it was mixed with oil of vitriol, at a concentration or strength of 40° Baumé; it was obtained chiefly from North and South America, and from France. Alum was made in standard-sized batches, 7,600 pounds of sulphuric acid being mixed with 4,300 pounds of the ground bauxite. A batch was agitated in a power-driven mixing tank for 4 hours, during the last 3 hours of which it was also cooked with exhaust steam from the company's own power plant. The alum solution was filtered to remove dirt and foreign matter, the filtering process taking 2 hours. It was then boiled in finishing kettles until one-half the water had evaporated, a process requiring from 8 to 12 hours, depending on atmospheric conditions. The condensed solution was run off into steel pans about 8 by 16 feet in size, where it crystallized into a solid mass about 3 inches thick. It required 24 hours for the batch to harden, at the end of which time it was cracked by pounding it with tampers. Large chunks of alum were loaded on wheelbarrows, wheeled to a hopper, and dumped into a grinding machine similar to the one used to grind bauxite, but the alum was not ground as fine.

When it came out of the grinding machine, the alum was usually put into storage in bulk. When required for shipment, it was packed in 200-pound jute bags or 450-pound barrels, all of which were lined with heavy wrapping paper. The alum could be shipped directly to customers, but was usually first placed in stock.

The mud left in the filter cloth was washed; the water drained off was used to dilute the oil of vitriol for future batches from 50° to 40° Baumé, and the mud was thrown away.

MATERIAL COSTS

Bauxite was purchased in large quantities; it was unloaded in the open, and was transferred to small storerooms located in the process building, these stores being kept filled to capacity. The company owned both a track scale and a wagon scale, on which the materials were weighed when transferred to process. All bins in the storeroom were of the same size, so the quantity of bauxite on hand might at any time be readily determined, thus providing a check upon the foreman's daily reports.

All materials received had to be reported to the general office by the receiving department; no invoices were paid unless the quantities received corresponded with the purchase order and the invoice, after all adjustments had been made. The receiving clerk was supplied with a copy of every purchase order, showing the quantity and quality of materials ordered, and the cost when that was known. The materials ledger was ruled in six double columns to provide a complete record of purchases and consumption for a period of six months. The invoice cost of the materials, inward freight, containers, duties, insurance, handling charges, and any other items of expense which were directly chargeable to the cost of raw materials were transferred to the "Debit" column of the Raw Materials account. In the case of sulphuric acid, which lost value through evaporation, the actual loss which occurred between the time when it was received and when it was used had to be included in the cost of the material. If incoming containers were salvaged or returned to the vendor, the amount received was credited to the account to which they were originally charged.

The foreman of each department reported daily to the works office the quantity put into process. These reports were summarized weekly and the summary was sent to the purchasing department to keep the purchasing agent informed on the trend of consumption. In a rising market these reports assisted him in determining whether or not to order before the minimum quantity of material had been reached. The monthly reports of consumption were made either from the daily report of the foremen or from a physical inventory. The monthly reports showed the opening inventory, purchases, consumption, sales, adjustments, losses, and closing inventories. This report was often based on estimates, since it was impossible to secure accurate figures when materials were handled in large quantities or stored in large piles in the open. Materials handled in small quantities were easily and accurately accounted for. The opening inventories, purchases, and sales were each month tied in with the general books and reconciled, as far as possible, with the Raw Material accounts.

Materials were charged to manufacturing at the end of each month on an average cost basis. This average rate was determined after the works office had made its monthly report to the general offices of the quantity of materials consumed and the losses known to have been sustained from evaporation or other causes.

LABOR

When the entire plant was operated at capacity, 225 men were employed, not including foremen, office employees, and salaried officers and research staff. But during slack seasons, the payroll had been as small as 165 men. Manufacturing operations required comparatively little labor, because many processes were run continuously with mechanical equipment. The handling of raw materials and finished products required the largest proportion of direct labor; approximately 95% of the labor of the service departments was employed in maintenance or plant construction. The alum department alone employed normally about 25 men.

Every laborer was required to punch a time clock whenever he entered or left the plant. The number of hours each man had worked, obtained from the time-clock ribbon, was entered on a Payroll Sheet (Form 1).

PAYROLL SHEET

S	M	T	W	T	F	S	Explanation	How Employed	Clock Number	Name	Total Hours	Rate	Amount

Hall Chemical Co.

Form 1.

At the end of the week, the hours for each man were extended and multiplied by his rate to obtain the total amount of wages for the week. A carbon copy of this Payroll Sheet, excluding the columns for days of the week, was sent to the general offices to serve as a notification to the cashier of the amount of money to be paid, and as a record for use by the auditing department.

The foreman sent to the accounting department of the works office a Daily Distribution of Labor Sheet (Form 2), showing processes worked on, time spent on each, and hourly rate.

In the manufacture of alum the processes were classified, for this purpose, as follows: Grinding bauxite, mixing bauxite and sulphuric acid, cooking, filtering, evaporating, cracking, grinding, filling bags or barrels, and cleaning up. The foreman's time was not included in this daily report, because his work was entirely supervisory.

DAILY DISTRIBUTION OF LABOR

Date Foreman

Distribution	Operation	Name	Number	Time	Rate	Total Daily		
						Time	Rate	Amount
	Grind Bauxite							
	Acid Bauxite Imp.							
	Cooker "							
	Filter "							
	Finishing "							
	Grinding "							
	Cracking "							
	Filling "							
	Clean Up "							
	Acid Bauxite Neut.							
	Cooker "							
	Finishing "							
	Grinding "							
	Filling "							

NOTE: The foreman of each department turns in daily an actual record of the men in his department, showing what they did, the length of time they were on the operation, and the rate of pay. This sheet is so arranged that a check for accuracy on the time and the amount can be had

Hall Chemical Co.

FORM 2.

FOREMEN'S DAILY LABOR REPORTS

Date

Foreman

Month	Day	Total		
	1			This form is used to recapitulate the foremen's Daily Labor reports. Only the amounts are shown. The names or type of labor are written in at the top.
	2			
	3			
	4			
	5			
	6			
	7			
	8			
	9			
	10			
	11			
	12			
	13			
	14			
	15			
	16			
	17			
	18			
	19			
	20			
	21			
	22			
	23			
	24			
	25			
	26			
	27			
	28			
	29			
	30			
	31			

Hall Chemical Co.

FORM 3.

A check on the accuracy of the daily reports, for time and amount, was obtained by cross-totaling and comparing with the Time Clock Record. The daily reports were summarized, by operations, on monthly sheets (Form 3), which had a column for each type of work performed; the monthly labor cost of any operation might then be obtained by adding the column in which that operation was summarized.

The monthly summary was authority for a journal entry crediting Payroll and debiting the accounts for each operation; debits to Payroll were made weekly from the Cash Book, on the basis of the Weekly Clock cards as summarized on the Payroll Sheet.

OVERHEAD

The expenditures of the Hall Chemical Company in the manufacture of alum were in the following proportions: Material 52%, labor 8%, power 14%, supplies 3%, repairs 8%, overhead 15%. The company considered power, supplies, and repairs in the same class with productive labor; these costs as a group were called "Conversion Costs" on the Cost Sheet. The Manufacturing account was debited monthly with the amount of each of these items; any expenses not used directly on productive processes were charged to Overhead.

Overhead expenses, which were 15% of the manufacturing costs, included taxes, insurance, depreciation, works administration, and laboratory and general expenses. Works administration included all costs incidental to the works office; general expense included the overhead of service departments, indirect labor not chargeable to repairs and plant construction, trucking and teaming and other miscellaneous expenses, including a share of the general plant administration. The totals of the various components, of overhead were charged to Manufacturing monthly, by the aid of a Burden Distribution Sheet. Only in the case of research was there any exception, research being charged to Surplus. The Hall Chemical Company maintained the following shops: blacksmith, carpenter, electrician, mason, machine, pipe, plumber, and paint. Only a small percentage of the labor of these shops was not definitely chargeable to Repairs or Plant Construction. When the payroll was prepared, it was classified by departments in order that the total amount of wages paid to employees in any department might be known. The amount of wages chargeable to Maintenance and Plant Construction was credited to the Shop accounts, and the balance, if any, was added to the overhead of the shops, which was charged to the manufacturing departments through General Expense.

The Cost Accounting records were kept in the general office. Each month the works office reported to the accounting department of the general office the quantity of products manufactured during the month. This report (Form 4) was summarized from daily records of production.

MONTHLY REPORT OF FINISHED GOODS

Works Month
Product
Date of Report Pounds As

A	Opening Inventory			A
B	Adjustments (Surplus, Black; Shortage, Red)			B
C	Production			C
D	Purchases			D
E	Transfers From			E
	Total 1 (A + B + C + D + E)			
F	Sold			F
G	Used	Department	Quantity	
				G
H	Trans. to			H
I	New Stock			I
	Total 2 (F + G + H + I) = Total 1			

	Efficiencies Basis	Per Cent
1		
2		
3		

Hall Chemical Co.

Form 4.

From other reports prepared by the works office the accounting department at the general office prepared a Monthly Cost Sheet to show in detail the costs of the product for the month previous, classified into three main groups, namely, Materials, Conversion Cost, and Overhead. A sample of one of these reports is shown as Form 5.

LEDGER ACCOUNTS

For each main division of the works there is a Subsidiary Ledger, containing the Expense and Inventory accounts, and controlled from the General Ledger. The trial balance for the Alum

COSTS OF OPERATIONS FOR THE MONTH OF OCTOBER, 1925

Materials Used	Pounds	Net Tons	Cost per Net Ton	Total	Total Cost for the Month	Cost per Net Ton	Percentage of Cost per Ton	Standard Percentage of Cost	Variation from Standard
Bauxite	2,789,800	1,394.90	$20	$27,898					
Oil Vitriol	7,550,000	3,775	10	37,750					
Sulphide Liquor	85,520	42.76	50	2,138					
5,000 Net Tons Produced					$67,786	$13.5572	53.38+	52.	+1.38
Conversion Costs									
Labor:									
Operating Labor			6,000						
Grinding Labor			2,500						
Clean-up Labor			150						
Miscellaneous Operating Labor			700						
Salaries			600						
Yard Team			15	$9,965		1.993	7.85−	8.	−.15
Power:									
Tractor No. 1			$300						
Tractor No. 2			10						
Steam			12,000						
Electric Power			5,000						
Air			750						
Light			10						
Water			400	18,470		3.694	14.55−	14.	+.55
Supplies:									
Fitter Cloth			$3,000						
Direct Purchased Supplies			150						
Transfers			10						
Storehouse Expense			300	3,460		.692	2.72−	3.	−.28
Repairs			$10,000	10,000	41,895	2.000	7.87+	8.	−.13
Overhead									
To Taxes:									
City			900						
State			200						
Insurance:									
Fire			750						
Liability			350						
Use Occupancy			105						
Depreciation			3,500						
General Factory Expense			5,500						
*Laboratory,		$600							
Works Office			6,000	$17,305	17,305	3.461	13.63−	15.	−1.37
Total charged to production of alum									
Total Net Tons produced = 5,000									
Cost per Net Ton					$126,986	$25.3972	100.00	100.00	0.00

* Research is charged to surplus.

FORM 5

Department Ledger is shown below; it will be seen that labor and expenses are not subdivided here to the same extent as in the Cost Sheet, Form 5; the further analysis in the latter report is prepared from the detailed reports elsewhere referred to. All Accrued and Prepaid accounts were kept in the General Ledger, only the corresponding Expense accounts being kept in the Factory ledgers.

HALL CHEMICAL COMPANY

TRIAL BALANCE—ALUM DEPARTMENT LEDER, MAY 1, 19—

Bauxite	$ 97,640	
Oil Vitriol in Alum Department	115,250	
Sulphide Liquor	5,486	
Materials in Process	2,356	
Labor and Burden in Process	1,184	
Operating Labor	25,000	
Grinding Labor	10,000	
Miscellaneous Operating Labor*	4,750	
Salaries—Superintendence	2,500	
Power Plant Costs†	72,648	
Supplies—General‡	12,825	
Supplies—Packing	11,562	
Storehouse Expense	1,310	
Repairs and Maintenance	39,735	
Taxes	4,350	
Insurance	4,500	
Depreciation	14,000	
General Factory Expense	23,100	
Laboratory	2,600	
Works Office Expense	23,500	
Returnable Containers	250	
Finished Alum—Bulk	130,136	
Finished Alum—Packed	30,722	
Payroll Distributed		$ 39,750
Expenses Distributed		212,630
Labor and Overhead Adjustment	415	
Net Balance as per Alum Dept. Control Account		383,439
	$635,819	$635,819

* Includes Clean-Up Labor, Yardteam, Tractors I and II.
† Includes Steam, Electric Power, Air, Light, Water.
‡ Includes Filter Cloth, Direct Purchased Supplies.

PROBLEM

Open ledger accounts for the Alum Department Ledger, as shown in the foregoing trial balance, and post in them the amounts given below, representing the summary total for operations for the month of May, 19—. Show, also, those General ledger accounts which are affected by these operations, namely, Alum Department Control, Sales, Cost of Sales, Accounts Receivable, Accounts Payable, Acid Department Control, Taxes Prepaid, Cash, Surplus, Insurance Prepaid, and Reserve for Depreciation. Take a trial balance of the Alum Department Ledger, and prepare the May Operating statements for the department.

PURCHASES OF MONTH, AS SHOWN BY PURCHASE BOOK:

Bauxite, 3,000,000 lbs. at $20.00 per ton	$30,000
Supplies—General	3,000
Supplies—Packing	2,500
Repair Materials	2,000

In connection with these purchases, returnable containers were received, for which total charges of $115.30 were made to the alum department. During the period containers were returned to vendors to the value of $138.50, and credits obtained for that amount.

The oil of vitriol received in the alum department from the department in which it was manufactured amounted to $38,500; the sulphide liquor obtained from filtering the mud was 88,000 pounds, which, valued at the standard rate used for this purpose of $50 per ton, amounted to $2,200. This credit to Materials in Process was supposed to cover the value of materials only, and not to include anything for labor and burden of the previous processing.

The Cash Book and Voucher Register showed the following items as being charged to the alum department:

Payroll:	
Operating Labor	$ 6,500
Grinding Labor	2,700
Miscellaneous Operating Labor	1,150
Expenses:	
Salaries—Superintendence	850
Power Plant Costs	19,200
Storehouse Expense	325
Repairs and Maintenance Labor and Expense	8,800
General Factory Expense	5,800
Laboratory	700
Works Office Expense	5,900

Taxes for the year were prepaid during this month, the amount being $12,900. The Laboratory charge of $700.00 was for research, and therefore chargeable to Surplus.

Amounts were charged through the Alum journal as follows:

Taxes	$1,075
Insurance	1,100
Depreciation	3,500

The following materials were put into process during the month:

Bauxite	2,800,000 lbs. at	$20 per ton,	$28,000
Oil Vitriol	7,600,000 lbs. at	10 per ton,	38,000
Sulphide Liquor	86,000 lbs. at	50 per ton,	2,150

The total expenses of the month, amounting to $54,050, and the total payroll of $10,350 are transferred to Labor and Burden in Process.

When the work finished during the month had been totaled, it was found that Materials in Process, $65,996, and Labor and Burden in Process, $62,064, were transferred to Finished Goods. Of these amounts, $100,810 went to Finished Alum—Bulk, and $27,250 to Finished Alum—Packed. The inventory at the end of the month of Alum—Bulk was $127,136, and of Finished Alum—Packed, $31,400. Alum produced was 5,100 tons.

Sales of alum during the month amounted to $140,300.

2. Plymouth Construction Company

METHOD OF ACCOUNTING: HOW SHOULD A CONSTRUCTION COMPANY ACCOUNT FOR ITS WORK?

The Plymouth Construction Company had been in business about 14 years, and like most building companies had until recently paid little attention to its accounting. When the company first began business competition was not keen, contracts were fewer, and the working force was smaller so that personal supervision was possible to such a degree that the executives in the firm had some reason to believe that all materials, labor, and expenses were properly accounted for. As the business grew, the firm employed more workmen and more timekeepers. It was one of the latter who became disgusted with the meagre records and instructions and complained about conditions, at the same time beginning to develop a system which would be adequate. He so impressed the executives with his enterprise that he was assigned to the home office, where he was delegated the task of developing a complete system of accounting for building jobs.

Contracts for buildings were obtained by submitting bids based on architect's specifications, and the provisions of the contracts taken were carefully drawn up to prevent subsequent misunderstandings. In making up the general estimate of the cost of a building, preliminary bids were obtained from other firms for specialized subcontract work, such as heating and plumbing, which the company did not wish to undertake. When the entire cost of the job had been estimated, the company added a fee of approximately 6% of the total, which it called the builder's fee, and which presumably represented the profit on the work. The contract, however, was generally worded so that if the firm was able to complete the job at a lower cost than had been estimated, the saving would be divided between the company and the client, but if the job cost more than the contract called for, the company stood the loss.

The first step after obtaining a contract under the new system developed was to make up a budget for the building, a procedure which required a detailed study of all parts of the job. Final bids were requested by the company from firms which might perform the subcontract work, and on the basis of these bids the budget estimates for those items were established. The engineers of the company made detailed estimates of the cost of the work which they were to do, and as a guide in the developments of their estimates the cost accounting code established by the company was used in two ways; first, it brought to the mind of the engineers all the aspects of the work, so that nothing was overlooked, and second, it caused the estimates to be developed along the same lines on which the actual costs would afterwards be reported.

COST CODE

The cost accounting code had been developed by the new timekeeper with two objects in view, namely, to facilitate the reporting of costs, and to have a uniform classification of the costs used on the different jobs. The code was broken down into 12 main sections, corresponding to the principal divisions of work done on a construction job; each section was further subdivided into as much detail as was desired in the classification of costs. Each general class of work was coded by capital letters, while sub-classifications were reported by numbers. The first section of the code was as follows:

General Conditions

G. C. 1. Supervision, Timekeeper, Checker, Messenger and Watchman.
2. Surveys, Sounds, Tests, Samples, Batter Boards, and Bench Marks.
3. Permits and Bond.
4. Prints and Photographs.
5. Insurance.
6. Telephone and Telegraph.
7. Expediters and Inside Superintendent's Expense and Traveling Expense.
8. Temporary Office and Sheds (Includes Equipment and Stationery, etc.)
9. Temporary Toilets.
10. Temporary Lights and Water.
11. Temporary Heat.
12. Temporary Roadways.
13. Guards, Lights and Signs.
14. Winter Conditions (Snow and Ice).
15. Cleaning Windows and Replacing Broken Glass.
16. General Clean-up and Removing Rubbish.
17. Legal Service and Engineering Advice.

The other main divisions of the code were as follows:

General Classification	Symbol	Number of Sub-accounts
Excavation	E. X.	12
Form Work	F.	8
Reinforcing Steel	R. S.	5
Concrete	C.	19
Cement Finishes	C. F.	5
Masonry (A)	M.	20
Masonry (B)	T. P. B.	10
Masonry (C)	T. C. S.	9
Rough Carpentry	C. Y.	19
Millwork	M. W.	13
Storage	S.	5

The Storage accounts were used in connection with materials on hand, which had to be recorded in order to balance the records at the end of each month.

WORKING ESTIMATE

Building
Location
Architect

Date
Sheet of

Location	Quantity	Material	Unit	Material	Unit	Labor
		Excavation, sheet piling, foundations, etc.:				
		Concrete, 1—1.46 @ $2.70......$3.94				
		2— .44 @ 1.70...... .75				
		4— .89 @ 2.50...... 2.23				
		$6.92				
	7,030	Cubic yards, general and trench excavations	$1.70	$11,951		
	1,245	Cubic yards, general backfill	.75	934		
	8,760	Square feet, sheet piling	.75	6,570		
	530	Cubic yards, concrete for footings, column footings, etc.	6.92	3,668	$2.00	$1,060
	330	Cubic yards, concrete for walls	6.92	2,284	1.50	495
	614	Cubic yards, concrete for basement floor	6.92	4,249	1.50	921
	70	Cubic yards, concrete for vault (bank)	6.92	484	1.50	105
	7,000	Square feet, wood forms for footings, etc.	.06	420	.16	1,120
	11,100	Square feet, wood forms for walls	.06	666	.16	1,776
	2,400	Square feet, wood forms for vaults	.06	144	.16	384
	20	Tons reinforcing steel	65.00	1,300	35.00	700
	850	Wood piles 1030–20–20600	18.00	15,300		
		Pumping		5,000		
		350 975 600		1		
		Spurs, needles, sheet piling for underpinning		925		
	30	Cubic yards, masonry for underpinning	20.00	600	10.00	300
	300	Square feet, repairs to concrete floors for underpinning	.20	60	.20	60
		Integral waterproofing compound		785		$6,921
				$56,340		
				6,921		
		Water		90		
		Removal of rubbish		500		
		Plant and equipment		1,500		
		Liability insurance		307		
				$65,658		
		Miscellaneous		2,000		
				$67,658		
		Masonry: Mortar, 1—2.5 @ 2.70......6.75				
		3—1.05 @ 1.70......1.79				
		8.54 cu. yd.				
	110,000	Common brick, Brick, 18; Mortar, 6	$0.24	$26,400	$0.24	$26,400
	21,300	Face Brick, Brick, 30; Mortar, 6	.36	7,668	.60	12,780
	47,600	Square feet, T. C. furring blocks	.09	4,284	.09	4,284
		Square feet, 3-in. T. C. partition blocks				

	45,224	Square feet, 4-in. T. C. partition blocks, Brick, 11; Mortar, 02.	$ .13	$5,879	$ .11	$4,975
	720	Square feet, 12-in. T. C. partition blocks	.35	252	.25	180
	12,236	Square feet, T. C. column covering (also in T. C. partitions and furring)	1.05	1,285	.15	1,835
	36,000	Square feet of fronts cleaned down	.01	360	.04	1,440
		Mason material for granite, .07; Limestone, 840; Arch, t. c., 112.		952		
		Hauling and setting granite				2,000
		Setting, Architectural, t. c.				2,000
		Anchors for cut stone		2,000		
				$49,080		$55,894
				55,894		
				$104,974		
		Water		100		
		Cutting and patching		1,250		
		Removal of rubbish		1,000		
		Hoisting		3,000		
		Scaffolding		2,500		
		Liability insurance		2,515		
				$115,339		
		Miscellaneous		10,000		
				$125,339		
		General Conditions:				
		Removal of rubbish—final clean-up		$1,000		
		Surveys		100		
		Temporary offices and equipment		400		
		Street permits		200		
		Temporary water closets		150		
		Temporary protection to adjacent property		200		
		Overhead bridge		1,380		
		Temporary fences		292		
		Cleaning, repairing broken glass		500		
		Photos and drawings		300		
		Telephones and telegrams		200		
		Superintendent, Field and office staff		7,500		
		Watchmen		1,980		
		Expediters and inside superintendents		2,500		
		Transportation		500		
		Liability insurance		556		
		Tests and samples		100		
		Batter boards		100		
		Guards, lights, signs, etc.		200		
		Temporary sheds		400		
				$18,558		
		Miscellaneous		7,000		
				$25,558		

FORM 1. Plymouth Con. Co.

BUDGET

Building
Location
Architect

Date
Sheet of

Location	Quantity	Material	Unit	Material	Unit	Labor
		Demolition		$ 1,700		
		Excavation, backfilling, sheet piling, piling, basement floor, vault underpinning, foundations, etc		67,658		
		Masonry		125,339		
		Waterproofing		2,900		
		Floor and roof arches		39,772		
		Granite		5,600		
		Limestone, blue stone, models		61,000		
		Carving, setting				
		Cement floors, fill, sidewalks, curbs, etc.		19,829		
		Tile		4,500		
		Marble		27,650		
		Slate		1,730		
		Roofing and sheet metal		6,900		
		Steel sash		11,118		
		Hollow metal		23,691		
		Lathing and plastering		28,000		
		Glass and glazing		2,625		
		Hardware		4,000		
		Painting		2,454		
		Ornamental and miscellaneous iron		10,000		
		Structural steel		83,050		
		Mail chute		1,110		
		Carpentry		11,000		
		Elevators, door closers and interlocks		28,620		
		Heating and ventilating		45,200		
		Plumbing		36,000		
		Electric		10,500		
		Sprinkler		17,800		
		Ash lift		650		
		Architectural t. c. work		6,000		
		General conditions		25,558		
		Contingencies		16,546		
		Builders' fee		47,500		
				$776,000		
		Carry Forward				

Plymouth Con. Co.

FORM 2.

WORKING ESTIMATE

The detailed figures of the engineers for each part of the job were typed on sheets of paper, and when completed were known as the Working Estimates (Form 1) for the building.

BUDGET

A summary statement of these sheets, including the bids for the subcontract work, formed the Budget (Form 2) for the building.

COST ACCOUNTING RECORDS

Responsibility.—The timekeepers on the jobs were essentially assistants to the superintendents and were personally responsible for the accuracy of all records and reports made of the progress

ORDER

Job
No.
Date
M
Please furnish to

Date	Quantity	Description	Price	Charge to Subdivision

NOTE.—Render separate invoice in triplicate for each order.
Give order number on each invoice.

Job No.
Per

Extra Order No.

Material to be delivered or work to be done on or before
If not completed on this date, we reserve the right to cancel this order.
If this order is for work to be done on a time and material basis, the amount of labor and material furnished must be certified daily by our superintendent.

Plymouth Con. Co.

FORM 3.

of the work. On a small job the timekeeper selected usually had sufficient training so that he was competent to check the amount of work completed as well as to handle the office routine. On larger jobs the timekeeper had an assistant or checker who gathered the routine information required, while an engineer reported the amount of work completed.

MATERIAL RECORDS

The materials required for the building as the job progressed were ordered by the district office of the company, on the blank shown in Form 3.

Order Blank.—When materials arrived at the job the timekeeper or his assistant checked the amounts received and made out in triplicate the Receiving Slip shown in Form 4, giving sufficient information for identification and accounting purposes.

RECEIVING LIST

No.

Received from

192

Date	Quantity	Description

Material Checker

Plymouth Con. Co.

FORM 4.

Receiving List.—The timekeeper on the job kept one copy of the form and sent the others to the home office, so that it could be used to check the bill of the vendor when it was received. When material was returned to a vendor a slip similar in form was made out to record the credit. Another form was used to record any material or equipment that was transferred from one job to another in the same locality.

Charge Memo—Subcontractor.—The company at times did work or sold material to its subcontractors who, for example, might not wish to put up a staging, or wanted to buy mortar or

CHARGE MEMORANDUM

Book No. Date

To

The following has been done by us at the Building and is chargeable to your account, for which you will receive a bill from our main office; if you have any objection to this charge, please make it within *five days*, before the charge is entered upon our books.

Superintendent

Date	Quantity of Hours and Material	Kind of Material or Labor, and for What Furnished

Use this form for labor, material, and expenses furnished on account of subcontractors.

Render these memorandums promptly at least once a week; send both copies to main office.

Have this memorandum O.K'd by the subcontractor's foreman, if possible.

Do not give rates on original but only on yellow copy.

The above work was done

Subcontractor's Foreman

Plymouth Con. Co.

Form 5.

cement. The record of such transactions giving the details as to labor and materials, was made on Form 5, which the subcontractor or his foreman was required to sign.

Job Record—Material Received.—The form used for Materials Received is shown as Form 6. The company's foreman at the job took materials as they were required for the work in progress, and reported to the timekeeper, generally on the time slips, the amount and class of work for which the materials were used. The timekeeper was responsible for checking the accuracy of these reports and keeping track of what materials were used in the different parts of the building. On the basis of the reports described, the timekeeper made up his monthly summary sheets of the material handled, which were known as job records.

MATERIALS RECEIVED							
Date	Sacks Cement	Sacks Lime	Cubic Yards Sand	Cubic Yards Gravel	Cubic Yards Mixture	Cubic Yards Grit	Cubic Yards Cinders

Form 6.

Job Record—Material Used.—These sheets had separate columns for each kind of material, and the amount to be entered were summarized regularly from the receiving slips. Form 7 illustrates the sheets used to record the material that had been requisitioned for the different types of work.

Separate sheets were made up for each class of work for which material was required; this system was, therefore, of value in checking the final results of the job when overruns occurred, for all the material used for each class of construction was accumulated in one record. The sheets were also used as a source from which entries were made to the Summary Cost Sheet for the job (presented later).

MATERIALS USED

Concrete: Class

Date	Cost Symbol	Mix	Sacks Cement	Cubic Yards Sand	Cubic Yards Gravel	Cubic Yards Mixture	Cubic Yards Cinders	Sacks Lime	Cubic Yards Concrete Poured

Plymouth Con. Co.

FORM 7.

LABOR ACCOUNTING

A correct record of the time spent by the men on the job was secured by checking their working time in three separate ways, namely, by the men's Time checks, by the foremen's Time reports, and by the timekeeper's reports.

When the men came to work in the morning, they had to secure from the office their Time checks; if they came late they were docked 15 minutes or more, according to the extent of their tardiness. The men, when leaving the job, returned their checks to the office; if it was the regular stopping time they merely

FOREMAN'S DAILY REPORT

Job Date

Item	Quantity	Description of Work	Total Hours	Rate	Amount

Foreman

Form 8.—Front.

Numbers	Total Hours for Day			
Total				

Plymouth Con. Co.

Form 8.—Back.

dropped them into a box, but if it was at any other time they handed them to the timekeeper or clerk who made a memorandum of the hour at which they left. This procedure gave a check on the total hours worked by each man.

Foreman's Daily Time Sheet.—Each foreman on the job was also required to turn in a Daily Time Report, which is illustrated by Form 8.

On the front of the report the foreman indicated the class of work his men had been doing, the description of the work, the total productive hours for each class of work, the labor rate being paid, and the total labor charge for each class for the day. The back of the report was used to show in detail the number of men working on each type of construction, and the number of hours each workman spent on the job that day.

Time Sheet.—In addition to the foremen's reports, the checker kept a Time book. At regular intervals throughout the day he went over the job and checked the presence of each man and the class of work on which he was employed; if a man was missing, he conferred with the foreman to determine what he was doing or if he had left the job.

The foremen's Time slips and the timekeeper's records were required to agree, and, in addition, the total time for each man as shown by their records had to agree with the total time recorded on the employee's Time check. When these records had been brought into agreement, which was done daily if necessary, the timekeeper entered on the Payroll sheet (Form 9) the elapsed time for each man.

The payroll week ran from Friday till Thursday, and after the sheet had been completly filled out, it was forwarded to the home office, where the paymaster put up the money and took it to the job on Saturday when the men were paid off.

Monthly Labor Distribution Sheet.—For purposes of calculation of the liability insurance premium, another record of similar nature was made up about every three months. The insurance company had classified the types of work performed on a construction job according to their nature, and the company accumulated the wages paid for labor under those different classifications, the premiums paid being based on the total labor cost.

At the end of the month a Distribution Sheet was made up

TIME SHEET

Job No.

Building

Week Ending 19

Superintendent

	Number	Name	F	S	M	T	W	T	Extra	Total Hours	Rate	Amount Paid	Amount Due

Timekeeper

Plymouth Con. Co.

Form 9.

which showed for each class of work the total labor cost for the period, as illustrated in Form 10.

MONTHLY LABOR DISTRIBUTION

Week Ending 192

General Conditions:				
G. C. 1.	Supervision		$ 600	
G. C. 1.	Timekeeper		200	
G. C. 1.	Watchman		170	
G. C. 2.	Surveys (Helpers)		80	
G. C. 10.	Temporary Lights (Carpentry)		50	$1,100
Plant and Equipment:				
C. 16.	Repairs to Tools Equipment		$ 40	40
Hoisting:				
C. 15.	Engineer (Concrete)		$ 140	140
Concrete:		Quantity		
C. 1.	Labor Pouring	250 cu.yd.	$ 750	
C. 2.	Labor Pouring	80 cu.yd.	120	
C. 8.	Smoothing Exterior Wall		50	920
Re-Steel:				
R. S. 4.	Placing	40 tons	$1,200	1,200
Masonry:				
M. 2.	Brick Masons	30 M	$1,000	
M. 2.	Brick Helpers	30 M	500	1,500
				$4,900
Charge Memos:				
Waltener Corp. (Hoisting Materials)				$ 40
Massachusetts Bridge Co. (Storing Equipment)				25
				$4,965

NOTE.—All foremen on the job are required to fill out daily labor tickets of the hours worked by men and also the distribution of the time, the Timekeeper at intervals to check personally the foremen and see if the time and distribution is accurate.

Plymouth Con. Co.

FORM 10.

This record was made up as a preliminary step to filling out the Cost Sheet, where all the costs of the job for the month were summarized.

COST SHEET

The Cost Sheet (Form 11) was a statement of the progress of the work; the amount of material and labor expended prior to

MATERIAL AND LABOR DISTRIBUTION

CONDITIONS

Average Temperature
Number of Contract Working Days
Number of Days Lost on account of Rain, etc.
Number of Days Allowed to Complete
Forms at. . . . . .Floor
Arches at. . . . . .Floor
Walls at. . . . . .Floor
Structural Steel at. . . . . .Floor
Job No. Name

COMPLETED WORK—COUNTERCHARGES

Labor Material

"Previously Reported"

Total of Current and Finished Items to Equal Total of Payroll to Date.

Month of 192

Payroll This Month. . . . .
Total Previous Payrolls. . . . .
Total Payroll to Date. . . . .

SCHEDULE CURRENT—WAGES PAID

Hours

Brick Masons. . . . .$
Stone Setters. . . . .
Hoist Engineers. . . . .
Iron Workers. . . . .
Carpenters. . . . .
Laborers. . . . .
Cement Finishers. . . . .
Painters. . . . .
Trucks. . . . .
Teams. . . . .

Class	Quantity	Output This Month	Previous Output	Total To Date	Labor Unit Month	Labor Unit Total	Labor and Material Unit Total

Material	Received During Month	Total Received	On Hand	Used Previous	Used During Month	Unit Value	M	T	M	T	M	T	M	T
Cement Dark................														
Cement White...............														
Sand.......................														
Sand White.................														
Gravel.....................														
Mixture....................														
Lime.......................														
Cinders....................														
Common Brick...............														
Face Brick.................														
Fire Brick.................														
Furring Tile...............														
Partition Tile, 2-in.......														
Partition Tile, 3-in.......														
Partition Tile, 4-in.......														
Partition Tile, 6-in.......														
Partition Tile, 8-in.......														
Column Covering, 2-in......														
Column Covering, 3-in......														
Column Covering, 4-in......														
Backer Tile ( )............														
Backer Tile ( )............														
Backer Tile ( )............														
Gypsum Block, 3-in.........														
Gypsum Block, 4-in.........														
Nails......................														
Lumber.....................														
Re-steel...................														
Total Value............$														

Payroll Distribution
Total

Signed: ______________________
Timekeeper

Plymouth Con. Co.

FORM 11.

this period, and the amount of material and labor expended in the past month, were given on it.

The information for the "Materials" section at the left-hand side of the sheet was obtained from the Job records. The column headings opposite "Class" in the middle section were taken from the accounting code and represented the types of work being done on the job. The "Quantity" line was used for the designation of the unit of measurement by which the work was gauged. Each column for the different classes of work was divided into sections for the monthly and the cumulative total of the material that had been used. The amounts that were entered in each column were obtained directly from the Job records of material used, and as they had been summarized to obtain the information for the inventory section the detailed amounts on each line equaled the totals of material used shown at the right-hand side of the sheet. Special Adjustment accounts for material charges which sometimes had to be opened to bring the Cost Sheet into agreement with the home-office records are discussed later. The materials listed in each column were priced and extended below, to get the costs of materials for the different classes of work, which were then entered on the "Total Value" line at the bottom of the page. On the "Payroll Distribution" line the labor cost

TO PLYMOUTH CONSTRUCTION COMPANY, DR.

Itemized Payment Requisition No.

Building Date

Architect Owner

Contractor or Vendor	Amount on Contract and Extras	Previous Requisition	This Requisition	Total Requisition	Amount to Complete
Subcontracts			$25,500.00	$25,500.00	
Payrolls			5,000.00	5,000.00	
Sundries			6,162.00	6,162.00	
			$36,662.00	$36,662.00	
Credits:					
Discounts			100.00	100.00	
			$36,562.00	$36,562.00	
Fee			2,924.96	2,924.96	
Total			$39,486.96	$39,486.96	

Plymouth Con. Co.

FORM 12.

for each class of work was entered from the Monthly Recapitulation sheets. The total labor and material cost of the job was obtained by the addition of the amounts on these two lines, and the division of the totals at the bottom of the page by the "outputs" gave the unit costs that are called for on the form.

Monthly Requisitions.—Each month the company sent a statement to its client which was known as the Monthly Requisition (Form 12).

Under the terms of the contract used by the company payment was to be made each month for the cost of the work completed, as summarized on the Requisition Sheet. Supporting the requisition was another similar sheet (Form 13) but which showed the details of the items given.

TO PLYMOUTH CONSTRUCTION COMPANY, DR.

Itemized Payment Requisition No.

Building Date

Architect Owner

Contractor or Vendor	Amount on Contract and Extras	Previous Requisition	This Requisition	Total Requisition	Amount to Complete
Subcontracts:					
Dayton Co.	$ 7,000.00		$ 3,000.00	$ 3,000.00	$ 4,000.00
Waltener Corp.	5,000.00		2,500.00	2,500.00	2,500.00
Walker Elevator Co.	12,000.00		8,000.00	8,000.00	4,000.00
Massachusetts Wrecking Co.	2,500.00		2,000.00	2,000.00	500.00
Massachusetts Bridge Co	15,000.00		10,000.00	10,000.00	5,000.00
			$25,500.00	$25,500.00	$16,000.00
Payrolls:					
January 6			$ 1,000.00	$ 1,000.00	
January 13			1,300.00	1,300.00	
January 20			2,200.00	2,200.00	
January 27			2,500.00	2,500.00	
			$ 7,000.00	$ 7,000.00	
Sundries:					
Royal Blue Print Co.			$ 40.00	$ 40.00	
Marple Survey Co.			22.00	22.00	
Wardet Stationery Co.			150.00	150.00	
Massachusetts Edison Co.			75.00	75.00	
Water Supply Co.			125.00	125.00	
Builders Supply Co.			5,000.00	5,000.00	
Prodle Hardware Co.			350.00	350.00	
Knibock Co.			200.00	200.00	
Wellman Hoist Co.			200.00	200.00	
			$ 6,162.00	$ 6,162.00	
Credits:					
Discounts: Builders Supply Co.			$ 100.00	$ 100.00	

Plymouth Con. Co.

FORM 13.

APPLICATION FOR PAYMENT

Name of Firm	Date
Building	Amount of Contract
Class of Work	

We hereby make application for payment in the Sum of $ on account of work performed by us on our Contract at the above building to 192

Extra or Credit Orders. (List in detail by P. C. Co. Change Order Numbers)		Other Extra or Credit Orders. (List in detail and state authority)	
Change No.	Change Order Numbers	Change No.	Change Order Numbers
	$		$

Total Extras to Date
Total Credits to Date
Net Extras to Date
Original Contract
Total Contracts and Extras

Value of Work Performed on Contract to Date
Value of Works Performed on Extras to Date
Total Value to Date
Less Reserve of 10% as per Contract
Amount Previous Payments
Amount of This Application

By____________________

Contracts and Extras Checked
Payments Checked
Value of Work Approved for $

By____________________

No application from subcontractors for payment will be honored unless presented on this form.

Submit all applications in triplicate on or before the 27th day of the month.

Plymouth Con. Co.

FORM 14.

These two sheets were supplemented by invoices and records covering the material purchased and the details of the subcontract work completed. The subcontractors put in applications for payment to the company on the sheet shown in Form 14.

These applications for payment were checked by the company and if approved were included on the monthly requisition sent to the client. On subcontract work generally 10% of the value of the work performed to date was withheld as a margin of safety to protect the company in case the subcontractor did not complete his job in a satisfactory manner.

List of Expenditures.—Agreement between the records kept on the job and those kept in the home office was secured by having the cost of the work as shown by the monthly Cost sheets equal the amounts of the monthly requisitions. The policy of the company was to bill the owners only for those expenses which had been approved for payment, and as all financial transactions

LIST OF EXPENDITURES

Job No. 100 Month of

Building Owner

General Conditions		Payrolls		Office	
		Date	Job	Expediting	Inside Supt's.
Blue Prints	$40.00	1/6	$800.00	$80.00	$120.00
Surveys	22.00	1/13	1,130.00	60.00	110.00
Office Supplies	150.00	1/20	1,000.00	85.00	115.00
Lights and Water	200.00	1/27	1,300.00	60.00	140.00
	$412.00		$4,230.00	$285.00	$485.00

Plant and Equipment:	
Rental of Mixers—2 weeks	$200.00
2 Dozen Picks	35.00
2 Dozen Shovels, Square Point	30.00
2 Dozen Shovels, Round Point	30.00
1 Dozen Barrows	125.00
½ Dozen Conc. Diggers	120.00
½ Dozen Bull Points	5.00
3 Sledges, No. 16	5.00
	$550.00
Hoisting:	
Two weeks' Rental of Hoist	$150.00
Trucking of Hoist	50.00
	$200.00

Miscellaneous:	
3000 Sacks Cement	$2,250.00
200 Cubic Yards, Sand	400.00
500 Cubic Yards, Gravel	1,500.00
300 Sacks Lime	150.00
35 M. Common Brick	700.00
Summary:	
Payrolls	$5,000.00
Subcontracts	25,500.00
Sundries	6,162.00
Fee	2,924.96
	$39,586.96
Discount	100.00
Net Total	$39,486.96

Plymouth Con. Co.

FORM 15.

Original Estimate	$1,176,639	Cube	1,738,874	Building	Page
Extras	63,723	Area		Location	
Total Estimate	1,240,362	Cost, cents	.674	Architect	
Actual Cost	1,172,949	Cost, cents		Job Began	
Saving	67,413	Cost, RM		Job Ended	

General Description: Concrete walls and piers. Structural steel frame 26 stories. Trimmed with ornamental cast stone. All brick work backed up with backer tile. Partitions all gypsum block, cinder arches, pyrona doors. Tile floors and wainscot marble in toilets. Two coat brown plaster throughout (rough) painted. All floors magnasite. Independent heating plant with three boilers. Otis elevators (3).

Typical Plan and Elevation:

Labor Rates:

Labor	9	Brick	14	Carpenter	12
Mechanics	12	Stone	14	Iron	14
		Lath	12	Plaster	12

Budget Item	Description	Per Cent Total Cost	Cost Per Cubic Feet	Estimated Cost	Actual Cost
Demolition		0.28	.0019	$3,400	$3,400
Excavation—Shoring					
Underpinning—Concrete					
Footings and Foundations		4.80	.0324	56,140	56,408
Floor and Roof Construction					
Cement Fills and Finish		4.62	.0312	56,275	54,280
Structural Steel		10.24	.0691	120,084	120,203
Exterior Stone		1.26	.0085	14,954	14,794
Granite		0.06	.0004	700	760
Interior Marble		0.72	.0048	8,493	8,478
Slate Sills		0.02	.0001		250
Terrazzo—Int. Tile		3.31	.0223	40,746	38,882

Models		0.18	.0012	2,250	2,150
Furring Lathing Plaster		6.22	.0419	88,048	72,984
Water Proofing—Damp Proofing		0.27	.0018	1,985	3,273
Roofing Sheet Metal		0.72	.0048	7,438	8,513
Glass—Glazing		0.79	.0053	8,861	9,378
Window Screens		0.09	.0006	1,355	1,098
Hardware		1.18	.0079	14,169	13,860
Miscellaneous Ornamental Iron		1.42	.0096	15,860	16,726
Metal Windows		1.71	.0115	18,550	20,073
Hollow Metal					
Kalamein—Bronze		3.80	.0256	57,906	44,677
Refrigeration		0.74	.0050	8,953	8,700
Elevators—D—Waiter					
Sidewalk Lift		4.66	.0314	54,793	54,664
Plumbing		12.91	.0871	156,828	151,510
Heating—Ventilating		4.87	.0328	61,142	57,124
Electric Wiring		2.27	.0153	29,638	26,651
Painting		2.84	.0192	39,767	33,415
Magnasite Floor		1.66	.0112	25,669	19,512
Store Fronts		0.13	.0008	875	1,560
Carpentry	Includes Caulking	1.95	.0131	20,032	22,934
Overhead Bridge		0.08	.0005	1,100	1,016
Masonry	Includes Hoist, Scaffolds, Plant-Cutting	15.89	.1072	205,048	186,440
General Conditions		5.16	.0348	50,976	60,629
Contingency				9,720	
Fee		4.99	.0337	58,607	58,607
		100.00	.674	$1,240,362	$1,172,949

Plymouth Con. Co.

FORM 16.

LABOR AND MATERIAL SUMMARY

Building Page

Item	Estimate Quantity	Actual Quantity	Estimate Unit		Actual Unit		Estimate Cost	Actual Cost	Gain	Loss
			Material	Labor	Material	Labor				
General Conditions:										
Supervision Field							$15,455	$10,987	$4,468	
Supervision Office							8,352	10,843		$2,491
Surveys—Tests Samples							400	472		72
Permits—Bond							800	1,476		676
Blue-Prints—Photographs							500	771		271
Liability Insurance							7,685	8,231		546
Telephones							240	397		157
Travel Expense							450	192	258	
Temporary Office and Supplies							750	2,777		2,027
Temporary Toilets							150		150	
Temporary Lights—Power							5,000	10,434		5,434
Guard—Lights—Signs							450	223	227	
Winter Conditions							800	421	379	
Cleaning Windows, Replace Glass							900	260	640	
Miscellaneous Rubbish							5,000	5,459		459
Cleaning (Final)							3,057	6,507		3,450
Legal Service								169		169
Temporary Fences							367		367	
Repairs Adjoining Property							100	110		10
Rubbish Chute							520	900		380
							$50,976	$60,629	$6,489	$16,142
										9,653
Masonry:										
Brick, Common Per 1,000	284,900	488,000	$21.27	$25.96	$20.54	$22.89	13,456	21,197		7,741
Brick, Face Per 1,000	719,500	639,146	46.57	67.80	49.25	67.95	82,295	74,881	7,414	
Brick, Fire Per 1,000	2,300	2,775	65.00	60.00	53.40	56.30	287	304		17
Coping Tile Lin. Ft.	50			3.00	(Conc.	Used)	150	45	105	
Grouting Cu. Yd.	124	125	5.30	1.70	5.00	2.00	868	875		7
Clean-Pointing Sq. Ft.	91,200	91,200	.01	.053	.003	.036	5,902	3,699	2,203	
Part Tile, 3-in. Sq. Ft.	5,300	45,056	.11	.12	.107	.135	1,219	10,918		9,699
Part Tile, 4-in. Sq. Ft.	5,620	7,900	.12	.12	.113	.14	1,349	2,003		654
Part Tile, 6-in. Sq. Ft.	27,500	23,455	.17	.15	.16	.15	8,800	7,511	1,289	
Backer Tile, 8- and 12-in. Sq. Ft.	64,900	38,665	.28	.27	.25	.27	35,439	20,054	15,385	
Plaster Block, 2-in. Sq. Ft.		10,563			.09	.11		2,083		2,083
Plaster Block, 3-in. Sq. Ft.	121,662	78,793	.10	.09	.09	.11	23,134	15,546	7,588	
Plaster Block, 4-in. Sq. Ft.		750			.11	.10		158		158

Plaster Block, 12-in. . . . . Sq. Ft.		850			.34	.12		385		385
Column Covering, 2-in. . . . . Sq. Ft.	19,000	12,242	.11	.18	.13	.17	5,510	3,665	1,845	
Column Covering, 3-in. . . . . Sq. Ft.	7,810		.11	.18			2,265		2,265	
Column Covering, 4-in. . . . . Sq. Ft.	7,856	16,450	.16	.22	.15	.19	2,985	5,599		2,614
Flue Lining . . . . . Lin. Ft.	35	274	.31	.50	.54	1.00	28	424		396
		(Only Brush Coated)					2,367	274	2,093	
Anchors							150	11	139	
Cutting Patching							8,444	4,490	3,954	
Hoisting Scaffolds							9,700	9,841		141
Tools—Equipment							700	2,477		1,777
							$205,048	$186,440	$44,280	$25,672
									18,608	
Carpentry, Rough:										
Centers, Arches							570	529	41	
Protecting Finished Work							550	404	146	
Protecting Openings and Enclosures							500	2,533		2,033
Temporary Stairs—Ladders							900	1,090		190
Brass Rods and Sockets							589	180	409	
Wood Bucks								890		890
Floor Sleepers							360	186	174	
Copper Deck								199		199
Rough Hardware							300	207	93	
							$3,769	$6,218	$863	$3,312
Material Prices:										2,449
Cement	$2.52 Bal.									
Sand	2.00 Yd.									
Lime	.35 Sack									
Prepared Mortar	6.00 Yd.									
Brick, Common	14.00 per 1,000									
Brick, Face	38.00 per 1,000									
Part Tile, 3-in.	85.00 per 1,000									
Part Tile, 4-in.	90.00 per 1,000									
Part Tile, 6-in.	136.00 per 1,000									
Gyp Block, 3-in.	.075 Sq. Ft.									
Gyp Block, 4-in.	.09 Sq. Ft.									
Backer Tile. 8-in.	142.00 per 1,000									
Column Covering, 2-in.	74.10 per 1,000									
Column Covering, 4-in.	125.60 per 1,000									

Plymouth Con. Co.

FORM 17.

were carried on in the home office the amounts to be put on the requisitions were determined without reference to any records kept at the job. This condition made it necessary to adjust the Cost Sheet to equal the requisition and as a guide to the timekeeper the Summary Sheet (Form 15) detailing the items on the requisition was made up and sent to him.

In the case of the labor charges there was no adjustment to be made, as the amounts included in the requisition equaled the wages paid during the period which the timekeeper had analyzed for entry on the cost sheet. The total of the subcontracts, the amount of the builder's fee, and any other independent items were entered on the Cost Sheet as forwarded from the district office, as they did not tie in with any record on the job.

The Material records, however, usually had to be adjusted because payment for the material was seldom made just at the time it was used on the job; the amount of material paid for by the district office had to be shown on the Cost Sheet in order to make it and the requisition balance. If it so happened that the same amount had been used on the job had been paid for by the company, the Cost Sheet and the requisition would balance automatically. If, however, more material had been paid for by the company then had been used on the job, a Storage or Inventory account for the difference had to be opened up which served as a balancing item to bring the Cost Sheet and the requisition into agreement. The most common occurrence, however, was where material had been used but had not been paid for by the company. In this case a suspense account captioned "Materials Used but Unbilled" was opened up for the different types of construction work affected, and which indicated that these costs were not to be considered as an expense of the period. Materials on hand, but not accounted for on the monthly requisition, were merely shown in the "Inventory" section of the Cost Sheet.

FINANCIAL STATEMENTS

At intervals during the construction of a building, what were known as "Financial Statements" for the job were made up; they summarized the cost of all parts of the job to date, showing the accumulated cost of the work, and an estimate of what the expense would be to finish each class of construction. Detailed statements were made up to support each item shown on the General Recapitulation Sheet.

FINAL STATEMENT

On the completion of a job a summary statement was made up, showing the actual costs of the different parts of the building in relation to the estimates that had been made; Forms 16 and 17 were used for this purpose.

The costs per cubic foot which were worked out were useful for general checking and estimating purposes. On the basis of experience, it was known that certain types of construction cost about so much per cubic foot to erect. It was therefore possible to tell a prospective builder very quickly the approximate cost of the kind of building he desired. The ratios were also used to check the detailed estimates made up for different jobs, to see if they were within the limits that might be expected for that class of construction.

Can you suggest any simpler method of obtaining any part of the information provided in these records?

Would it be wise on any job to set up a small set of books for that job?

From the study of this case, what accounts do you think the ledger contains relative to each job?

3. Epworth Chain Company

GENERAL COST CONTROL: HOW MAY A GENERAL CONTROL OVER COSTS BE OBTAINED WHICH WILL COVER MANY VARIED PRODUCTS?

The Epworth Chain Company was located in western Pennsylvania, and made high-grade chains of many types and sizes, to serve different purposes. About 75% of production was for standard types of chain which were listed in the company's catalogue, the remaining 25% being special production to customers' specifications. The management expected, from the cost system, that it would (1) give them sufficiently close costs on individual lines of chains, standard and special, to enable them to set intelligent selling prices; although competition did not permit a uniform gross margin to be made on all lines, yet the company considered it necessary to know what the relationship was, as a guide for putting executive pressure on the manufacturing and selling departments; (2) supply a quick check on manufacturing costs and efficiencies by departments; (3) furnish total control figures by which Work in Process inventories and cost of goods sold would be available for balance sheet and operating statement purposes monthly.

The total quantities of chains made were reported monthly in feet to the works manager and accounting department; these were summarized into nine main groups, as shown in the following Form 1.

EPWORTH CHAIN COMPANY

To Messrs. Longley Phinney
Covert Banks

PRODUCTION FOR MONTH OF MAY, 1929

	Account Feet	Chain Feet
Light Roller	609,099 × 1	609,099
Light Block	15,391 × 2	30,782
Heavy Block	17,509 × 2	35,018
Motorcycle	51,260 × 3	153,780
X5282	8,817 × 2	17,634
Auto A	70,492 × 5.87	413,788
B	51,027 × 7.7	392,908
C	57,835 × 9.86	570,253
Special	76,464 × 5	382,320
Total	957,894	2,605,582

Copy to: Works Manager A. R. BOWLBY.

Epworth Chain Co.

FORM 1.

Each of these groups included a number of sub-types of chain, but it was considered by some of the officers, at any rate, that the chains within each of these main groups were sufficiently alike to justify the computations which were made from them. Regarding the light roller chains as a unit, they were rated as 1, and the other types were multiplied, as indicated in Form 1, to give a monthly total of chains made in terms of standard chain feet. These quantities were then used in working up departmental cost sheets on a unit basis, as shown in Form 2.

The chief items of expense were listed in Form 2, in monthly columns, in terms of dollars and cents per thousand feet of standard chain made, the latter quantity being noted at the bottom of each monthly column. The actual departmental costs for the month were compiled on Form 6, very soon after the month-end: by dividing these figures by the standard chain feet, Form 2 figures were obtained. A comparison with the average unit costs for the preceding year served to show whether anything was out of line. Form 2 sheets were furnished to the works manager monthly, and he transmitted them to the departmental foremen, who had regular meetings at which these figures were discussed. Two main types of argument would normally arise over these figures, one being in the nature of explanations of figures which were very different from average, and the other being complaints or questions from the foremen as to some particular charges made against their departments. Comments of this latter sort were especially common with regard to the last item, Indirect Charges, which, it will be seen, were apt to run around 20% of the total costs. This item included all those charges for which no definite basis could be found for making a charge to the departments, so that it was distributed in proportion to all other costs charged to the department; for this very reason, as well as for the size of the item, foremen were apt to direct their attacks against it. The management and the cost department had from time to time considered whether any better handling of this item could be had, or whether any part of it could be distributed directly, but had so far come to the conclusion that there was nothing to be gained in this way. It was felt that the discussions with foremen served to keep them alert to their job of keeping costs down to a minimum compatible with quality. Moreover, the form and manner in which these reports were prepared enabled them to be done quickly, in time for action to be taken about anything amiss more promptly than if the detailed figures had to be waited for.

Per 1000 Ch. Ft. TBX

	1928 Average	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.
Dir. L....	5.31	5.72	5.06	5.59	5.24								
Ind. L....	2.61	2.74	2.20	2.30	2.08								
Repairs...	.25	.29	.29	.16	.06								
Supplies..	.45	.43	.59	.57	.54								
Eq. Chgs..	1.23	.89	.89	.85	.83								
Power....	.18	.15	.15	.14	.14								
Rent.....	1.73	.96	.96	1.00	1.25								
Indirect..	3.42	2.53	2.40	2.59	2.57								
Total...	15.18	13.71	12.54	13.20	12.71								
Ch. Ft....	500,000	800,000	830,000	880,000	900,000								

Epworth Chain Co.

FORM 2.

But it was realized that these approximations were not accurate enough for working up the financial accounting totals for inventory and statement purposes, nor for the detailed costing of individual jobs; for these purposes another series of forms were used.

SPECIAL CHAIN COST SHEET

Job No. 4389–761 Month, March, 1929 Chain X710,063

Spec. Parts	710063	E 2316	5216		
Labor	23.84				
Burden	46.09				
Material	106.45				
Total	176.38				
Lb. Finish	825				
Cost per Lb.	.2137				
Rattling	.0075				
Hardening	.0396				
Coloring					
Totl. Cost Lb.	.2608				
Pcs. per Lb.	4.61				
Totl. Cost C	5.6572	2.42	2.8324		
Pcs. per Ft.	6.61	6.61	6.61		
Cost per Ft.	.3473	.1560	.1872		
Reg. Parts	3316	3116	5716		
Cost per C	2.48	2.86	3.02		
Pcs. per Ft.	13.32	13.32	13.32		
Cost per Ft.	.3303	.3810	.4023		

Special Tools	
Job	Cost
637	15.73
Total	

Assembly

Assembly	Labor	Burden	Total	Footage
X710063	23.83			
A710063	3.05			20 chs. of 175″ and 15 chs. of 173½″
A3316	4.70			
A2149	14.23			
Total	45.81	120%	100.78	510

Summary

Spec. Parts	.6905
Reg. Parts	1.1136
Assembly	.1976
Mfg. Cost	2.0017
Adm. and Pack.	.3152
Total Cost	2.3169

Special Materials

Part No.					
Size	504				
Kind	C. A. Ni.				
Pounds	900				
Price per Cwt.	9.75				
Burden per Cwt.	70				
Total Cost					

Posted A. M.
Figured A. M.
Checked
Finished P. B.
Checked
Entered

Epworth Chain Co.

FORM 3.

Form 3 was used to gather the costs of each special order, and on Form 5 the costs of each class of regular line goods were figured; for the latter, one set of cost sheets was made out each month, but for the former, the set was made at the end of

COST SUMMARY

Part No. 2331 Period, August–October

Service Cards

Operation		Labor	Burden
1	B4	121.64	
2	H2	76.44	
3	F9		.0340
4	G3		
5	K4	10.64	
6	S2		
7	D7	56.89	
8			
9			
10			
11			
12			
13			
14			
15			

Pounds of Material	7469
Kind and Size	
Price per Cwt.	13.70
Burden per Cwt.	.80
Total per Cwt.	14.50

Labor	265.61
Burden	479.69
Material	1,083.00
Total	1,828.30

Weight	6455	
Footage	35309	5.47 ft./lb.
Pieces		88.4 pcs./lb.

Assembly per Foot

Department	Labor	Burden	Material
RL			
RY			
RA			
RM			
RX			
RP			
RE			
Total			

Unit Cost	Foot	Pound	100 Pcs.
Labor	.0075		
Burden	.0136		
Material	.0307		
Hardening			
Rattling			
Coloring			
Mfg. Total	.0518	.2832	.3204
Packing			
Admin.			
Total			

	Figured	Checked	Entered
Date			
By	T. S.	A. K.	R. B.

Form 4. Epworth Chain Co.

each month, and again when the job was completed. One sheet was made up to show the unit costs for each part as shown in Form 4, and then a summary sheet, Form 5, was prepared to assemble the costs of all parts entering into that type of chain; it will be seen how the totals of Form 4, which covered Part No. 1233, are shown in Form 5 against that part number. On these cost sheets, materials and labor were direct charges, and burden was added as a percentage of labor costs. In the case of special orders, the cost sheets served as a check on the figures of the estimating department, which were prepared as a basis of quoting for the order; the cost sheets for regular lines were compared with standard cost figures, and might be used to check the computations prepared in Form 1.

COST SUMMARY

Part No. X2331 Period, August–October.

Service Cards

	Operation	Labor	Burden
1	Aug.	26.36	
2	Sept.	299.94	
3	Oct.	316.84	
4			
5			
6			
7			
8			
9			
10			
11			
12			
14			
13			
15			

Pounds of Material	
Kind and Size	
Price per Cwt.	
Burden per Cwt.	
Total per Cwt.	

Labor	643.14
Burden	729.96
Material	
Total	1,373.10

Weight	
Footage	28,000
Pieces	

Assembly per Foot

Part No.	Labor	Burden	Material
x2331	.0487		
2331	.0075	.0136	.0307
0331	.0052	.0084	.0377
8131	.0026	.0042	.0268
7631	.0011	.0043	.0232
5431	.0012	.0042	.0283
Std.	.0495		
Total	.0176	.0347	.1467

Unit Cost	Foot	Pound	100 Pcs.
Labor	.0176		
Burden	.0347		
Material	.1467		
Hardening	.0267		
Rattling	.0070		
Coloring	.0020		
Mfg. Total	.2842	.2241	
Packing	.0088		
Admin.	.0350		
Total	.3280		

	Figured	Checked	Entered
Date			
By	P. J.		A. B. M.

FORM 5. Epworth Chain Co.

INVENTORY CONTROL—WORK IN PROCESS

One other step remained to be completed, which was the computation of the total charges into and credits out of the Work in Process account in the General Ledger. For materials the sum total of the requisitions from stores into process was obtained and debited. For labor and burden, the charges were obtained, not by summarizing the charges on the detailed cost sheets for individual orders and different types of chain, but by ascertaining the total amount of direct labor payroll in each department; to this payroll amount was added an amount for burden, computed as a percentage of the direct labor cost, and added to it to obtain the total operating expense of the department. The rates for burden were recomputed monthly on Form 5, which was fre-

COST CHART

April, 1929

Department	Direct Labor	Indirect Labor Constant	Indirect Labor	Repairs	Supplies	Equipment Charges	Power	Rent	Total Items Directly Chargeable	Indirect Items	Total Operating Expenses	Overhead Rate
TBX												
RD-PM												
RFG	4,709.57	433.40	1,433.55	52.29	485.20	744.69	124.86	1,130.62	9,114.19	2,319.66	11,433.85	1.43
RFX												
RKC												
RKX												
RPX												
RRX												
RSR												
RSS												
RSX												
RY												
Total Bike												
CA												
RF												
RG												
RH												
RK												
RP												
RR												
RS												
Total Auto												
MC												
MP												
Special												
HS												
HSX												
Sprocket												
Total Mfg.												
EA, etc.												
FPT												
Mat'l Burden												
Grand Total												

FORM 6.

Epworth Chain Co.

quently enough to prevent them from getting too far out of line. A sheet was prepared showing the computed amounts of expense for various departments of the plant, with totals at the bottom; the total, thus found, for labor and burden was the amount chargeable to Work in Process; a journal entry was then prepared as follows:

Work in Process	$190,000	
Burden Adjustment	3,000	
To Accounts Payable, Cash, etc.		$193,000

The amount credited was the entire amount of the actual expenses for the month, made up from the Voucher Register of Vendors' invoices, and from other sources of charges to the factory. To get the credits in Work in Process, the quantities of the various types of chain shipped during the month were found from the Sales reports, and these were costed at actual costs; an Inventory record was kept of standard items, with actual unit costs attached. From this the month's sales of the regular line of goods was costed at the end of the month, and the totals of special orders were obtained from the cost sheets; in this way a total cost of goods sold was ascertained, and this figure was the credit to Work in Process. No intermediate account for finished goods was considered necessary.

Would it be better to set up a complete cost system which would permit of all the information needed for various purposes being supplied from the one set of records?

Would you advise the use of a Finished Goods account to cover inventories manufactured but not yet sold?

4. Portland Motor Company—No. 1

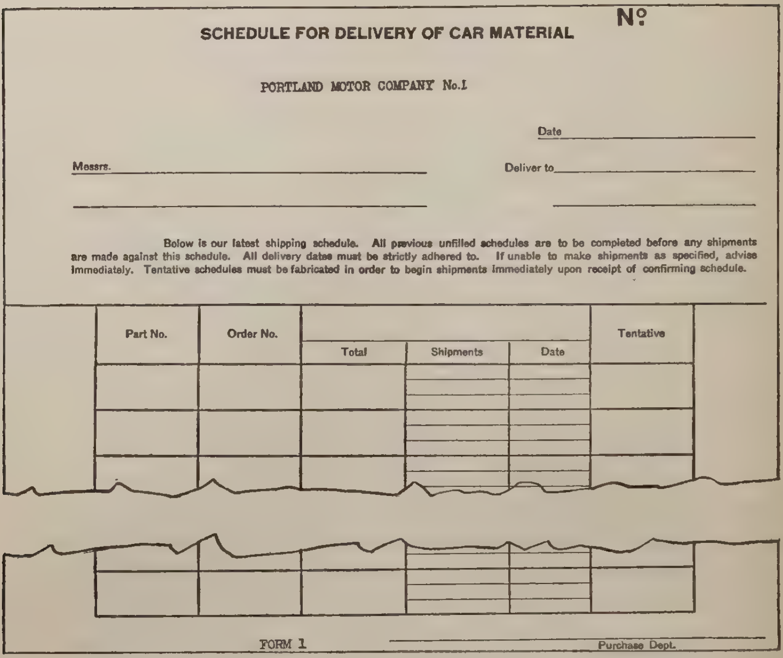
PURCHASING ORGANIZATION: HOW MAY A PURCHASING ORGANIZATION BE DEVELOPED TO PROVIDE FOR MASS PRODUCTION?

The Portland Motor Company was one of the leading makers of medium-priced cars in the country, turning out four general models known, respectively, as the Roman, Trojan, Spartan, and

Dorian; in each of these models the usual line of body styles was available. The entire line of cars included about 9,000 different parts, and the purchasing organization was designed to supply these parts to the assembly floor with the greatest possible speed and economy. The purchasing department was a consolidation of four departments which had previously existed, namely, a specification department, a purchasing department, a purchase follow-up department, and a material control department. The merging of all these into a single department was characteristic of the simplified procedure towards which the company was constantly striving. The former material control department had handled the perpetual inventory records; this, however, had been entirely abolished, as the operating plan of the new purchasing department rendered them unnecessary. As a result of a year or so of experience on the new basis, the management was satisfied that it could get along without the perpetual inventories for the greater part of the materials used; there was a thought, however, that possibly for a relatively small number of quick-moving parts and materials it might become desirable to install Perpetual Inventory cards for the purpose of keeping exact records of their movements in order to see that they did not run out of stock and hold up production. As the regular schedules of parts were more and more highly geared to run on narrow margins, there was, of course, an increased possibility that something might go wrong to hold up the general schedule. When under the old plan the perpetual inventories had been kept, materials were recorded only in quantities, and in units of one day's manufacturing requirements; however, even this simplified record required 16 men for its operation. The entire purchasing department after consolidation employed a staff of 104 people which was likely to be reduced to 94 by further simplification of the records, even though the volume of production was increasing. The department was subdivided into 13 groups, each headed by a buyer, and handling a different class of materials; under each buyer there were two follow-up men and a specification man; it was this way that the functions of the former departments had been combined with those of the purchasing department. The purchasing department worked in very close cooperation with the stores and production divisions with regard to material needs, and with the accounting department in respect to prices and invoicing. The movements of materials were under the control of the purchasing department, as far as the stockroom, where the production department assumed control. Inspection also was a separate function throughout the plant, both for raw materials and for work in process.

All purchasing of materials was done on the basis of a General Production Schedule for cars, which was prepared every month for three months ahead. On this schedule the different car models were listed down the left side, and in the next three columns the number of cars scheduled for each of the succeeding three months was inserted against each model. These car quantities were based on estimated sales. Beyond these were 14 other columns representing periods of time, extending from one day in the first column to two months in the last; under these period columns were inserted the numbers of parts which could be obtained for the different cars within the time indicated at the head of the column. These period classifications constituted the basis of the company's entire scheduling program and were known as "banks," and any part or class of materials was said to be on a one-day bank, a three-day bank, a half-month bank, or bank of any other period up to two months, according to the period of time which must elapse between scheduling delivery of that part from a vendor, and delivering it on the assembly floor ready to go on to finished cars. Based upon the original car schedule, the engineering and standards department supplied to the purchasing department detailed and exact specifications of all materials and parts required for these cars, and continuous efforts were made to shorten the time necessary for procuring these materials and making them available in the assembly department. When material was ordered, a Delivery Schedule (Form 1) was sent with the order to inform the vendor of the dates when deliveries must be made, these being arranged by the Portland Motor Company in conformity with the needs of their own general schedule.

Materials were divided in the purchasing department into two general classes, the first including parts which were purchased as parts ready for assembly, except for certain finishing operations, and the second including bulk materials which were to be fab-



No.

SCHEDULE FOR DELIVERY OF CAR MATERIAL

PORTLAND MOTOR COMPANY No. 1

Date ______________________

Messrs. ______________________ Deliver to ______________________

Below is our latest shipping schedule. All previous unfilled schedules are to be completed before any shipments are made against this schedule. All delivery dates must be strictly adhered to. If unable to make shipments as specified, advise immediately. Tentative schedules must be fabricated in order to begin shipments immediately upon receipt of confirming schedule.

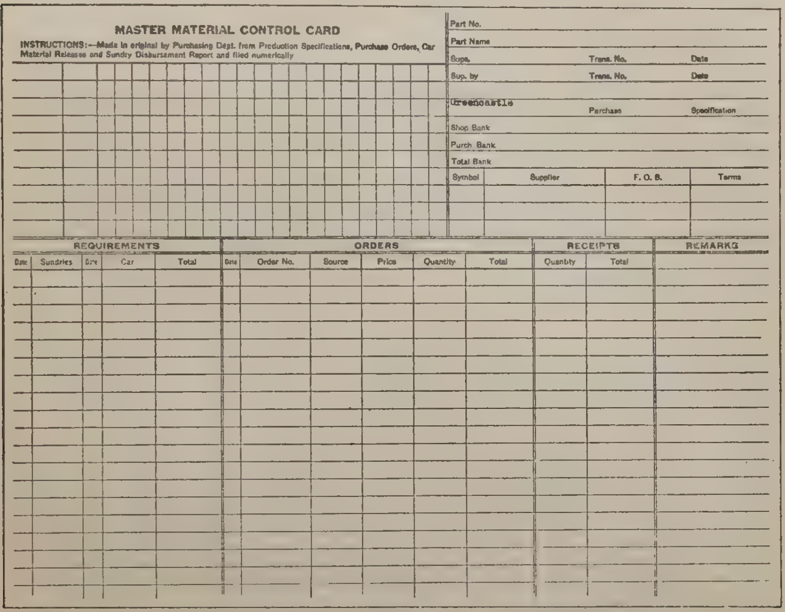
Part No.	Order No.				Tentative
		Total	Shipments	Date	

FORM 1 ______________________ Purchase Dept.

FORM 1. Portland Motor Company No. 1

ricated into parts in the shops of the Portland Motor Company. For each part in the first class of materials, a Master Material Control Card similar to Form 2 was kept; in the upper left-hand corner of this card were noted the numbers of the different car models on which this part would be used; in the top right corner full particulars of the part were noted, including changes from one design and part to another. "Shop bank" indicated the time required to pass these parts through the shops of the Portland Motor Company to the assembly department; "Purch. bank" was the time required for transportation between the vendor's plant and the works of the Portland Motor Company; the "Total bank" was therefore the total time required between delivery from the vendor's works and the arrival of the materials on the assembly floor. Below were columns indicating the actual requirements of the part as of various dates, the orders placed, and the receipts against these orders; this part of the record was continued on the back of the card.

For the second class of materials a Master Bulk Material Control Card (Form 3) was kept for each type of material. On this card were listed the description and quantities of the different parts which could be made out of that class of material, with



MASTER MATERIAL CONTROL CARD

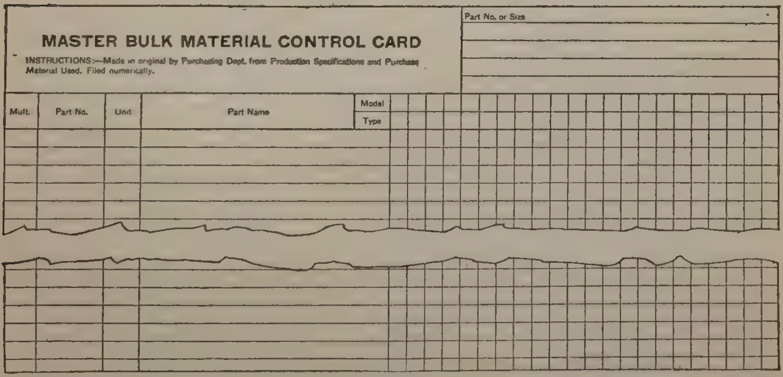
INSTRUCTIONS:—Made in original by Purchasing Dept. from Production Specifications, Purchase Orders, Car Material Releases and Sundry Disbursement Report and filed numerically

Part No.
Part Name
Sups. Trans. No. Date
Sup. by Trans. No. Date
Greencastle Purchase Specification
Shop Bank
Purch Bank
Total Bank

Symbol	Supplier	F. O. B.	Terms

REQUIREMENTS					ORDERS						RECEIPTS		REMARKS
Date	Sundries	Date	Car	Total	Date	Order No.	Source	Price	Quantity	Total	Quantity	Total	

Form 2. Portland Motor Company No. 1



MASTER BULK MATERIAL CONTROL CARD

INSTRUCTIONS:—Made in original by Purchasing Dept. from Production Specifications and Purchase Material Used. Filed numerically.

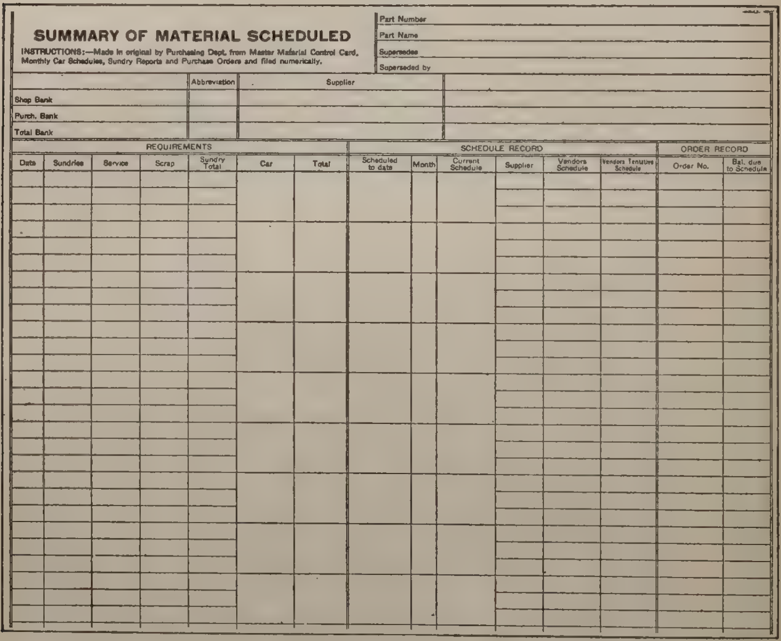
Part No. or Size

Mult.	Part No.	Unit	Part Name	Model Type

Form 3. Portland Motor Company No. 1

notations on the right side of the record of the types of car upon which these different parts could be used. It was the constant object to get as many different parts out of the same class of materials as possible, and to use each part on as many different models as possible, consistently with the requirements of satisfactory car design and engineering performance.

In conjunction with each of these Material Control cards a Summary of Material Schedule (Form 4) was prepared to record the actual purchasing of materials under the schedules, with notations as to the different deliveries from different vendors with a view to showing exactly how these deliveries tallied with the original schedules.



SUMMARY OF MATERIAL SCHEDULED

INSTRUCTIONS:—Made in original by Purchasing Dept. from Master Material Control Card, Monthly Car Schedules, Sundry Reports and Purchase Orders and filed numerically.

Part Number
Part Name
Supersedes
Superseded by

	Abbreviation	Supplier	
Shop Bank			
Purch. Bank			
Total Bank			

REQUIREMENTS							SCHEDULE RECORD						ORDER RECORD	
Date	Sundries	Service	Scrap	Sundry Total	Car	Total	Scheduled to date	Month	Current Schedule	Supplier	Vendors Schedule	Vendors Tentative Schedule	Order No.	Bal. due to Schedule

FORM 4. Portland Motor Company No. 1

The company made it a general policy to purchase materials only against Production schedules as described; only rarely did the buyers depart from these schedules to buy materials because they considered the market to be favorable. While giving adequate attention to the matter of discovering the lowest market prices for materials required, and to obtaining materials of the requisite quality the department placed greatest emphasis on the matter of curtailing the period or "bank" upon which each part or class of material was scheduled. It was the aim of the production department, in other words, to operate on a minimum inventory; one of the most forceful expressions of this policy was in the fact that the ledger did not contain a separate account for raw material inventories, but only one combined account for raw materials and work in process, it being understood that materials would not be scheduled to arrive at the plant until they were actually wanted to be delivered from the assembly floor and go on to Portland cars. In this way practically all materials were delivered from the works as finished cars within two months after being received, and three months was the absolute limit of time during which any materials were permitted to stay on the premises.

The company regarded this as a simplified system for handling purchases with a minimum of records; since consolidating the former departments, and abolishing the records previously kept, the business of the department had been handled more smoothly than before; the chief problem was in keeping the Material schedules up to date, especially with regard to changes in design and specifications made by the engineering department. In order to take care of instances in which the schedules had not worked with perfect regularity, a system of Shortage reports was in use, by which the stockroom informed the purchasing department daily of materials which had run or were threatening to run out of stock; it was, however, hoped to eliminate these Shortage reports also, partly by better scheduling, and partly by putting all items which could not be otherwise handled on a one-day bank basis, thus assuring constant attention to them.

Do you think that this plan insured a steady flow of production?

Did the plan lack any details that you would consider essential to proper control of this phase of the business?

5. Portland Motor Company—No. 2

COST ACCOUNTING: HOW MAY COSTS BE ASCERTAINED AND CONTROLLED UNDER CONDITIONS OF MASS PRODUCTION?

The Portland Motor Company had endeavored to organize its cost accounting work on the same principles as those which governed its manufacturing operations; everything was simplified to the utmost, and all operations which did not contribute to some essential end were eliminated. No continuous costs were kept on the current aggregate production of cars, yet the records were such that the current cost of any model was at all times known, while controllable expenses were budgeted by expense items and the actual expense checked against the budgeted amount regullarly. Apart from these matters, the manufacturing efficiency of the factory was checked by noting the extent to which the shops met their schedules as set by the engineering and planning departments.

The cost accounting procedure aimed first to ascertain the prime cost for each part entering into a car. All Vendor's invoices went through the cost department, which was therefore kept up to date as regards material prices. With regard to the quantity of material required for any one part, the cost department had the detailed specifications of the engineering department, which was checked with actual manufacturing performance on that part; in this way ideal conditions which might have been set up in the engineering department, but were incapable of being realized in the shops, were eliminated; the engineering specifications thus became identical with shop practice and the material cost thus ascertained for the part was an actual cost. Separate schedules were kept of defective material or workmanship, from which was ascertained a cost item for defective work, which was incorporated in the burden charge. In other words, the material cost of any part represented the current invoice price for the actual quantity of material in that part; if a part had to be machined or turned out of bulk material, the standard quantity of such material needed to make the part was the basis for the material charge.

The gathering of labor costs was based on the layout department's schedule of operations necessary to make that part; this also was checked against actual shop practice to see that the plans made in the layout department were being realized. About 98% of all these labor operations were paid for on a piece-rate basis, and the total labor cost for all the operations on a part was, therefore, easily ascertained. As in the case of materials, losses from defective work were incorporated in this burden charge.

The costing of individual parts was not carried beyond the point of ascertaining direct-material and direct-labor cost. For purposes of loading burden on to the product, the company regarded itself as a manufacturer of two main products, namely, bodies and chassis. The total burden of all the departments through which each of these products passed was assembled, and a separate percentage of burden to direct-labor cost was figured for each. This percentage was then available when the total cost of the car assembly came to be developed.

It was in the compilation of the total costs of this assembly that the Portland Motor Company had devised its most distinctive type of procedure. For every car model a "car-tree" was constructed to show all the parts entering into a Portland car, in sequence, as they were assembled; it required between 80 and 90 sheets of ordinary-sized paper to make up the car-tree for one car. The base or trunk of the tree represented the finished car, and from it two branches ran out representing the body and the chassis; these in turn were continuously subdivided until, on the outer edges of the car-tree, all the individual parts of the car were listed. This car-tree was made the basis of the cost accounting for the car model it represented. Against each part an abbreviated statement of the materials specifications for that part was entered on the tree, together with the material cost and direct-labor cost for it, figured as previously described. Whenever new contracts were entered into involving a change in the material cost of any part, or new piece rates or new operations went into force, the corresponding material and direct-labor costs for that part were changed immediately on the car-tree, which was accordingly always up to date. An adding machine tape sufficed to ascertain the total material cost and the total labor cost for the entire car; to the latter figure, subdivided into body and chassis, were added the percentages of burden expense as already computed. By keeping this car-tree record always up to date, the current actual cost per car was made available. The car-tree records were in fact revised every month for every model, and were regarded as the central cost accounting records by all executives of the company. When a model was first designed and approved for quantity production the car tree then constructed for it was used by the president and sales and production vice-presidents as a basis for setting a selling price; subsequently the various changes of the car-tree costs were compared with the costs shown on the original car-tree for that model to assure the executives that current manufacturing costs were running in safe relationship to the original costs and to the selling price set on the model. A Car Cost Fluctuation Report (Form 1) was prepared monthly to summarize the variations which had occurred.

One General Materials account was kept for the entire factory, including raw materials and materials in process; no advantage was seen by the officials in setting up a Raw Materials account and going through the procedure of making requisitions from raw materials into process. The Materials account was charged with the total of Vendor's invoices; the credit to that account was computed by taking the total of the material cost for all parts on the car-tree, multiplied by the number of cars of that model; the totals thus obtained for all models furnished the credit for the Materials account. The balance represented the combined inventory of raw materials and work in process at the end of the month; these inventories were constantly checked and very little discrepancy was found to occur. The Scrap account was budgeted and was pretty well under control, so that no large material variations could occur there. Total direct payrolls and burden expenses were debited into a Manufacturing Expense account, and the total labor and expense cost of finished cars produced, ascertained from the car-tree records as in the case of materials, was used as the credit for this account. Since a new percentage of burden to direct labor was figured each month, these credits also were sufficient to clear the account and keep the labor and burden work-in-process inventories in order.

The records here described covered everything which the cost

CAR COST FLUCTUATION REPORT

Month of May, 1929 Model Trojan Plant No. 1 Type No. 1 Regular Sedan

Instructions.—Made in quintuplicate monthly by Accounting Dept. from W784. Original forwarded to Vice-President, duplicate to Treasurer, triplicate to General Auditor, quadruplicate to Plant Prod. Manager, quintuplicate filed.

Part No.	Description	Period	Material			Labor								Overhead	
			Material	Material	*, Increase; †, Decrease	Mach. and Assy. Div.	Stamp. Div.	Forge Div.	Fdry. Div.	Body Div.	Engine Div.	Total	*, Increase †, Decrease	Total	*, Increase †, Decrease
158,172	Front Axle and Brake Assembly, Complete	Previous Month		18.86		.56	.01				4.20	4.77		11.93	
		Present Month		18.61	.25†	3.61	.01	.80				4.42	.35†	11.05	.88†
158,081	Rear Axle and Brake Assembly, Complete	Previous Month		40.76		4.65	.09	.17	.02		2.03	6.96		17.40	
		Present Month		40.60	.16†	5.61	.09	.16	.02		2.03	7.91	.95*	19.78	2.38*
158,134A	Frame Assembly, Complete	Previous Month		24.27			1.21					1.21		3.02	
		Present Month		24.60	.33*		1.02					1.02	.19†	2.55	.47†
158,208	Engine Assembly, Complete	Previous Month		105.53		.49		.14			43.18	43.81		109.52	
		Present Month		106.13	.60*	.49		.13			42.77	43.39	.42†	108.47	1.05†
158,269	Transmission Assembly, Complete	Previous Month		10.32		5.10	.09	.34	.99			6.52		16.30	
		Present Month		10.41	.09*	5.09	.09	.35	.99			6.52		16.30	
158,332	Front Wheels and Tires, Complete	Previous Month		38.68		.80	.01					.81		2.03	
		Present Month		38.51	.17†	.77	.01					.78	.03†	1.95	.08†
137,008	Rear Wheels and Tires, Complete	Previous Month		36.93		.73						.73		1.82	
		Present Month		36.79	.14†	.69						.69	.04†	1.72	.10†
158,306	Steering Gear, Complete	Previous Month		15.20			.13					.13		.33	
		Present Month		15.31	.11*		.13					.13		.33	
244,582	Body Assembly, Complete	Previous Month		255.76						89.04		89.04		222.60	
		Present Month		260.48	4.72*					87.88		87.88	1.16†	219.70	2.90†
	Sundries	Previous Month		165.33		17.61	6.80	2.89	.04	.02	1.77	29.13		72.83	
		Present Month		170.64	5.31*	15.60	6.79	2.77	.04	.02	.88	26.10	3.03†	65.25	7.58†
		Previous Month													
		Present Month													
		Previous Month													
		Present Month													
	Final Car Assembly	Previous Month		711.64		29.94	8.34	3.54	1.05	89.06	51.18	183.11		457.78	
		Present Month		722.08	10.44*	31.86	8.14	4.21	1.05	87.90	45.68	178.84	4.27†	447.10	10.68†

Signed ________________ Cost Clerk

Approved *T. H. Becker* Accounting Dept.

*Increase in black. † Decrease in red.

Portland Motor Co. No. 2

FORM I.

department of the Portland Motor Company kept in the way of regular routine records; it was understood that the greater part of the department's efforts would be directed to supplying special reports on special problems as called for by the various executives of the company.

Was the procedure here described sufficient to answer all the purposes which a cost system would serve?

Could this procedure be used in a factory of approximately equal size, but making a large part of its output to customers' orders?

6. Production Conditions in the Glass Industry[1]

INTRODUCTION OF MACHINERY: WHAT INFLUENCE DOES THE INTRODUCTION OF MACHINERY HAVE UPON LABOR PRODUCTIVITY?

In no other industry has the introduction of machinery had a more dramatic effect upon labor productivity than in the glass industry. Thus, to take an extreme example, in the blowing of 4-ounce prescription bottles, the average output per man is more than 41 times as great with the automatic machine as with the hand processes which were in general use less than 20 years ago. This means a great reduction in the number of workers necessary to turn out a given quantity of product. It also means a great change in the character of the labor force. Instead of a group of very highly skilled glass blowers, assisted by a group of unskilled "boys," the automatic machine employs mechanics and machine operators with little or no demand for child labor.

COMPARISONS OF LABOR OUTPUT AND COST IN HAND AND MACHINE PRODUCTION

How far-reaching these results have been will become self-evident from the few, but highly illuminating, examples, which follow:

Bottles.—A hand "shop," consisting of 3 skilled workers (a gatherer, a blower, and a finisher) and 4 helpers, can produce on the average 3.75 gross of 4-ounce prescription ovals per hour. The 1925 average output of the most up-to-date Owens automatic machine was 69.754 gross of 4-ounce prescription ovals per hour. The average output of the hand shop is 0.536 gross per man per hour, while with the automatic machine the average is 22.028 gross per man per hour, or more than 41 times as much as in the hand process.

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[1] Excerpts from *Monthly Labor Review*, April, 1927, p. 1.

Based on the 1925 wage rates, the direct blowing labor cost of a 4-ounce prescription oval made by hand would be $1.177 per gross. With the Owens automatic machine, the 1925 direct blowing labor cost of the same kind of bottle was 3.15 cents per gross. For every dollar spent on blowing a 4-ounce prescription oval by hand, the labor cost on the Owens automatic machine was but 2.70 cents.

Pressed Ware.—In making 8–9-ounce common table tumblers on the side-lever press, a hand shop, consisting of 3 skilled workers (a gatherer, a presser, and a finisher) and 6 helpers, produced in 1925 an average of 278.96 pieces per hour, or 31 pieces per man per hour. The Hartford Empire twin press, operated with an automatic conveyor, produced in 1925 an average of 1,903.54 pieces per hour, or 380.71 pieces per man per hour, more than 12 times as much as could be produced with the hand press. The direct labor cost of pressing 100 of these tumblers was with the hand press, $1.95 and with the automatic press, 13 cents. Thus, for every dollar spent on the direct labor of pressing common table tumblers by hand, it cost but 6.7 cents to press them on the automatic machine.

Electric-light Bulbs.—A hand shop, consisting of a gatherer and a blower, assisted by a section boy and a cutting-off boy, can produce on the average 121.98 40-watt electric-light bulbs per hour, or 54.21 pieces per man per hour. The 1925 average output of the new type Westlake automatic machine was 2,342.44 bulbs per hour, or 1,703.59 pieces per man per hour, more than 31 times as much as by the hand process. The average blowing labor cost by the hand process was $13.88 per 1,000 pieces, as compared with $0.470 by the machine process. The saving in labor cost effected by the automatic machine was 96.61 cents on every dollar required for the hand process.

MANUFACTURE OF BOTTLES AND JARS

The first more or less successful semi-automatic machine was invented in 1882 by Philip Arbogast, of Pittsburgh, Pa., and 11 years later this machine was successfully applied for the purpose of making vaseline jars. In 1896, a similar machine was invented for the purpose of making Mason jars. The growth of the semi-automatic machine from 1897 to 1905, as shown by the number of machines in use in each of those years, is given by Professor Barnett, as follows: 1897, 20 machines; 1898, 50 machines; 1899, 60 machines; 1900, 80 machines; 1901, 90 machines; 1902, 100 machines; 1903, 150 machines; 1904, 200 machines; 1905, 250 machines.

But the first really revolutionary change took place in 1904, with the successful introduction of the automatic machine, invented by M. J. Owens. This machine, where used, at once displaced all the skilled blowers and most of their helpers in the shops. The output of the new machine was so much greater and the cost of production so much less than by the hand and the semi-automatic processes, that had it not been for the restrictive policies of the owners of the Owens machine, these less economical processes would at once have been displaced by the automatic machine.

As it happened, however, the period of the Owens automatic machine was also the period of the development of semi-automatic machinery. In 1917, there were 200 Owens machines in operation in this country, but there were also in use 428 wide and narrow-mouth semi-automatic machines. At about this time, also, the "gob" feeder, which had been experimented with for some time, became a commercial success. This appeared to have certain advantages over both the Owens automatic and the semi-automatic machines. In the course of the next eight years the majority of the semi-automatic machines were reconstructed and equipped with automatic feeders so as to become completely automatic. The Owens machine has also undergone a series of important changes, especially as to the number of arms and the number of molds on each arm. The most modern type of Owens machine has 15 arms, each equipped with two molds, and each mold containing cavities for two or three bottles depending on the size of the bottle. At present, these automatic processes completely dominate the bottle-making industry. The semi-automatic process has disappeared entirely, but a small number of plants are still using the hand process for bottles which cannot be made more economically on the machine.

EFFECTS OF AUTOMATIC MACHINERY ON THE INDUSTRY AS A WHOLE

In view of the tremendous changes in man-hour output and labor cost due to automatic machinery, it may be worth while to examine more or less in detail the effects of the introduction of machinery on the industry as a whole. Table 1, compiled from census reports, shows the growth of the industry from 1899 to 1925 (the period during which the change from hand pro-

Table 1

Development of the Glass Industry, in Specified Years 1899 to 1925

Item	1899	1904	1909	1914	1919	1921	1923	1925
Total number of establishments	355	399	363	348	371	329	333	310
Bottles and jars	147	158	166	150	145	*	117	120
Pressed and blown ware	84	103	114	107	130	*	127	123
Window glass	100	103	*	64	79	*	65	42
Plate glass	16	17	*	19	17	*	17	19
Total number of wage earners:	52,818	63,969	68,911	74,502	77,520	54,748	73,335	69,371
Bottles and jars	28,370	*	*	*	*	*	24,010	21,704
Pressed and blown ware	12,546	*	*	*	*	*	27,196	21,507
Window glass	8,682	*	*	*	*	*	8,826	8,346
Plate glass	3,220	*	*	*	*	*	9,961	11,124
Output:								
Bottles and jars (thousand gross)	7,780	12,005	12,316	19,290	22,295	*	28,393	26,044
Pressed and blown ware (million pieces)	360	428	532	701	1,080	*	*	1,963
Window glass (thousand boxes)	4,341	4,852	6,922	8,020	7,380	5,201	10,204	11,343
Plate glass (thousand sq. ft.)	16,884	27,293	47,370	60,384	56,823	56,239	94,470	117,369
Value of output (000 omitted)	$56,540	$79,608	$92,095	$123,085	$261,884	$213,471	$309,353	$295.959
Bottles and jars	21,677	33,631	36,018	51,959	94,670	*	107,231	100,301
Pressed and blown ware	17,076	21,956	27,398	30,279	70,749	*	77,379	72,085
Window glass	10,879	11,611	11,743	17.495	41,101	24,026	42,623	37.525
Plate glass	5,159	7,978	12,205	14,774	33,348	37,261	66,103	57,207
Wages (000 omitted)	27,084	37,288	39,300	48,656	87,527	68,224	89,898	86,738

* Not reported.

duction to semi-automatic and automatic machinery took place) for the industry as a whole, and also, where available, for the four principal branches whose combined output constitutes more than 90% of that of the industry.

OUTPUT AND PRODUCTIVITY

From the labor standpoint, the most important change directly connected with the introduction of machinery in the glass industry has been the increase in output per wage earner employed. Table 2 shows a comparison of output per man in the four principal branches of the glass industry in 1899 and 1925. As there shown the increase in 1925 over 1899 was greatest in the case of bottles and jars, 338%; and lowest in the case of plate glass, 101.3%.

TABLE 2

YEARLY OUTPUT PER MAN IN SPECIFIED BRANCHES OF THE GLASS INDUSTRY, 1899 AND 1925

Branch of Industry	Unit	1899	1925	
			Quantity	Per Cent of Increase over 1899
Bottles and jars	Gross	274	1,200	338.0
Pressed and blown ware	Pieces	28,694	91,272	218.1
Window glass	Boxes	500	1,359	171.8
Plate glass	Square feet	5,240	10,551	101.3

In the figures for the separate branches of the industry there exists a slight error, due to the fact that the hours worked per day in 1899 and 1925 are not strictly comparable. For instance, in the bottle industry the regular hours of work were eight and one-half in 1899 and only eight in 1925. On the other hand, in 1899 nearly all the plants, following a long-established custom, suspended production for a period of two months, while in 1925 only a few plants stopped producing for a month or more, because of repairs or the usual reconstruction of tanks, which must be done every 12 to 18 months. Similar or somewhat different discrepancies in the hours worked also exist in the other branches of the industry, but their general effect on the output was so slight as to exert very little, if any, influence on the validity of the figures of productivity given.

In your opinion, would the introduction of automatic machinery for glass making impair the efficiency of hand labor remaining, or the quality of the product?

State the changes in accounting methods which you think the introduction of automatic machinery has necessitated in ascertaining the cost of manufacture of glass.

Prepare a brief outline showing a method of cost accumulation for the glass industry.

7. GRIFFIN AND COMPANY

IRON MANUFACTURE: WHAT COST INFORMATION IS NECESSARY IN THE MANUFACTURE OF PIG IRON AND WROUGHT IRON PIPE?

Griffin and Company was one of the leading producers of wrought iron pipe, a manufacture consisting of two main divisions, the first being the conversion of iron ore into pig iron, and the second, pipe manufacture. The latter division was further subdivided at this plant as follows: first, pig iron was manuufactured into muck bar by a puddling process; second, muck bar was manufactured into skelp and plate; third, the skelp and plate was welded into pipe; and fourth the pipe was cut, threaded, tested, marked, wrapped and provided with couplings.

PIG IRON COSTS

The costs of manufacture of all pig iron were assembled monthly on Form 1.

The quantity of each of the different types of pig iron made, and other facts of interest, were set forth on Form 2.

Variations from month to month in the per ton cost shown in Form 1 might often be explained by changes in the relative quantities of the different types of pig made, since No. 1 pig iron cost approximately $1.75 per ton more than No. 2. Costs would,

COST OF PRODUCING PIG IRON

Month of 192

	Production,		Capacity, Tons	Cost Per Ton	Per Cent Increase in Production	Per Cent Decrease in Production	
	Tons	Dec.					
This Month.................. Previous Month..............							
	This Month					Previous Month	
Particulars	Tons	Dec.	Price	Amount	Proportion per Ton Cost	Price	Proportion per Ton Cost
Material:							
Ore..........................							
Total....................							
Cinder....................							
Dolomite..................							
Scrap Pig Iron............							
Total....................							
Coke—Net Tons............							
Limestone.................							
Gravel....................							
Total Material...........							

Foremen Blowers and Clerks									
Direct									
Indirect									
Total Labor									
Expenses—Controllable:									
Stores and Supplies									
Repairs to Buildings									
Repairs to Machinery and Equipment									
Compensation Insurance									
Blast System									
Ladle House and Pig Casting Machine									
Trestle Maintenance and Repair									
Track Maintenance and Repair									
Locomotive Cranes									
Trucking									
Electric Light and Power									
Water									
Steam and Pumping									
Boiler Maintenance and Repair									
General Expense									
Laboratory Department									
Total Controllable Expenses									
Expenses—Apportioned:									
Plant General									
Injury and Hospital									
Slag Pits and Electric Shovel—Less Slag Sales									
Provision for Depreciation on Buildings and Equipment									
Provision for Depreciation on Freight Cars									
Provision for Renewal and Relining									
Provision for Idle Time and Contingencies									
Total—Apportioned Expenses									
Total Expenses									
Total Cost Above Material									
Total Manufacturing Cost									

Griffin and Company

FORM I.

COST OF PRODUCING PIG IRON

Month of 192

	Production								
	This Month			Previous Month			This Year to Date		
	Tons	Dec.	Per Cent	Tons	Dec.	Per Cent	Tons	Dec.	Per Cent
Production of Gray Forge Iron									
Production of No. 2 Foundry									
Production of No. 2 X Foundry									
Production of No. 1 Foundry									
Production of Castings									
Production of High Silicon									
Production of High Sulphur									
Total									
	Practice								
Number of Days Operated									
Average Daily Production G. T.									
Ore per Ton of Iron Produced									
Cinder per Ton of Iron Produced									
Coke per Ton of Iron Produced									
Limestone per Ton of Iron Produced									
Dolomite per Ton of Iron Produced									
Theoretical Yield									
Actual Yield									

Griffin and Company

FORM 2.

therefore, go up when a larger proportion of No. 1 pig was made, since the blast furnace could produce various grades of foundry iron and grey iron from the same ores. Grey forge iron was used in puddling, and the various grades of foundry iron were sold. Excess capacity of the furnace was used for producing foundry iron. The costs of the different types of pig iron were found from taking the actual cost of materials delivered to the furnace for each type, to which was added a standard furnace-hour rate which included both labor and burden, and which was multiplied by the number of hours devoted to each type of pig iron. This furnace-hour rate included all the ordinary current items of overhead; for relining a standard monthly charge was made based on the average period a furnace could be run without relining. Some cases have been known where furnaces lasted for four years without relining and others where they have lasted only a few weeks. The cost of relining even a small furnace amounted to from $40,000 to $50,000.

When a furnace was operated continuously, it was likely from time to time to be changed from one kind of pig iron to another while in process. This made an absolutely sharp separation between one kind and another impossible, but it could be done accurately enough for practical purposes. From the way the furnace was charged and the quantity they had tapped at various times, the operatives knew what class of iron to expect. Chemical tests were made of each tapping to determine the exact grade of the iron. It was the metal delivered from the furnace which constituted production upon which costs were figured.

Although it would have been ideal to carry the metal through continuously from ore to finished pipe without allowing it to cool off at the pig iron stage, the muck bar stage, and the skelp stage, this could not be done for many reasons. For similar reasons a separate costing for these various stages was necessary. Two types of furnace made pig; the merchant furnace made commercial pig for sale; it might belong to a company making later products in iron or steel, or it might be an independent furnace belonging to a company making pig only for sale. The conditions of supply and demand in the market often caused prices for the different grades of pig to vary disproportionately to their costs. From time to time, therefore, the company had to decide whether

COST OF PRODUCING MUCK BAR

Month of 192

	Production,		Capacity, Tons	Cost per Ton	Per Cent Increase in Production	Per Cent Decrease in Production	
	Tons	Dec.					
This Month							
Previous Month							
	This Month					Previous Month	
Particulars	Tons	Dec.	Price	Amount	Proportion per Ton Cost	Price	Proportion per Ton Cost
Material Pig Iron C. B.:							
Pig Iron							
Busheling Scrap							
Muck Bar Crop Ends							
Swarf							
Cast Iron Scrap							
Miscellaneous Scrap							
Total							
Ore							
Scale							
Total							
Total Material							
Less:							
Cinder							
Furnace Loss							
Total Credit							
Total Net Material							
Fuel:							
Coal—Net Tons							
Gas							

Cord Wood—Cords									
Total Fuel									
Labor:									
Foremen and Clerks									
Day									
Tonnage									
Total Labor									
Expenses—Controllable:									
Stores and Supplies									
Repairs to Buildings									
Repairs to Machinery and Equipment									
Repairs to Furnaces									
Compensation Insurance									
Trucking									
Rolls and Roll Turning Department									
Laboratory Department									
Boiler Maintenance and Repair									
Locomotive Crane Expense									
Tools									
Total Controllable Expenses									
Expenses—Apportioned:									
Electric Light and Power									
Steam Power									
Water									
Plant General (Including Local Taxes)									
Provision for Depreciation									
Provision for Idle Time and Contingencies									
General Expense (Rolling Mill)									
Injury and Hospital Expense									
Track Maintenance and Repair									
Miscellaneous									
Total Apportioned Expenses									
Total Expenses									
Total Cost Above Material									
Total Manufacturing Cost									

Griffin and Company

FORM 3.

to make pig for sale, and if so, which grade; or it might even be profitable for the company to buy pig. When for example the demand for steel products was below normal, the big steel companies might undersell the commercial furnaces for a time. Moreover, when the sales department asked for a special price on big orders, the president would never approve it without first seeing cost statements on that type of product; these statements were made up both with and without overhead, in order that the effect of taking or not taking the order might be fully apprehended; the cost figures were most likely based on standard costs for average runs, although sometimes they might be based upon the best runs of that product.

MANUFACTURE OF PIPE

The subsequent processes by which pig iron was made into wrought iron pipe may be briefly summarized as follows:

1. Pig iron and pipe scrap were mixed together and converted into muck-bar by puddling. Muck-bar was wrought iron in its first stage, which could later be reworked into other products, at the same time retaining wrought iron characteristics. Formerly puddling was almost a hand operation, consisting of the heating and mixing of metal in very small furnaces, in a way which would combine some amount of slag with the metal and give it the wrought iron qualities. A more recent process permits larger quantities of wrought iron to be made much more cheaply than under the old method.[1] The Cost sheet for this process is shown as Form 3.
2. The conversion of muck bar into skelp had the effect of further refining the iron, welding it more thoroughly, and the skelp was rolled to the exact widths and thicknesses required. The cost sheet for this process was similar to that for muck-bar.
3. Skelp was charged cold at one end of a furnace and pulled out at the other end, where it was welded as it was pulled out, having been heated to the correct welding temperature. In butt-welding there was only one operation; in lap welding, skelp was passed through one furnace and bent, and immediately passed through another furnace, heated again, and then welded.
4. Welded pipe was next finished by cutting the ends and putting a thread in them.
5. Some pipe had to be galvanized.

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[1] See "The New Story of Ancient Wrought Iron," in *World's Work*, February, 1929.

For each of these stages costs were gathered by process cost methods, there being a separate Cost sheet for each process and each service department similar to Form 3. About 400 different sizes and types of pipe were made; not every size was made each month, but a cost sheet was prepared, at the end of every month, for each size which had been run that month.

COST PROBLEM AND USES OF COSTS OF PIPE

For many years it looked as if steel pipe would displace wrought iron pipe completely, on account of its lower cost; but the far greater rust-resisting quality of wrought iron, and its capacity for resisting vibration strains, have within recent years restored wrought iron pipe to a substantial position in the trade. While steel has a higher tensile strength than wrought iron, it is also harder to thread; wrought iron has a fibrous quality which enables it to resist vibration. Cast iron pipe was another competitor, but it carries far greater weight per foot than wrought iron. Besides it cannot be threaded or bent and is much more likely to fracture. It was then not only a question of cost of purchasing new pipe, but the construction cost of taking out the old and putting in the new pipe were great. These were the conditions of competition in which Griffin and Company operated and which in a measure governed their cost practices.

COSTS AND PRICE FIXING

As a basis for quoting regular prices standard costs were used throughout all departments and products; for the purpose of valuing inventories actual costs were used. It was an understood policy that the sales department might, subject to the president's approval, quote special prices for an unusually large order, or to gain a new customer, or to accommodate a particularly satisfactory one. But such prices were always made with careful reference to costs, and it was felt that the sales department had to be watched, to see that no unsound practices developed. For the purpose of setting regular prices on the various lines, figures were assembled each year showing, for each size, the tonnage turned out for the past three years, the character and size of typical orders taken for that kind of pipe, and the costs assuming 100% operations throughout and also on normal operations throughout based on production equaling the average demand. That is to say, for the earlier stages of the product, such as pig, muck-bar and skelp, the costs were based on the two bases of full operations and the normal past operation; for the several sizes and kinds the additional costs of rolling, welding and finishing them were found, based on the quantity for each kind. Quotations to customers were made on a per foot basis, as that was the standard practice in the trade, but for general ready reference within the plant costs and prices per ton were frequently used. Overhead items for these various costs were divided into controllable and apportioned costs, and standard figures had been worked out for them all by departments and operating or auxiliary units.

Selling and administrative expenses, and charges for the necessary reserves, were then added to the manufacturing cost, to get a cost to make and sell, these added costs being applied in proportion to the manufacturing costs already accumulated. Cash discounts on sales which were very large were then deducted from the selling prices for the several lines, and the net prices compared with the best costs obtained as described above, to see that a satisfactory margin of profit was being obtained. Constant attention was paid by the president and by the controller to these comparisons, which were regarded as a main source of control over the manufacturing and the selling department alike. On one occasion, for example, the president, the controller, and the sales manager, using these figures, agreed on a list of sizes and kinds on which the profit was shown to be very high, and prices were cut on these, as a competitive measure, until the average profit on all lines was materially reduced. A new price level was thus established on Griffin pipe, and a basis was established for budgeting profits for the month and year; at the same time care was taken not to scale prices down to the point where Griffin products were competing on a price basis with other types of pipe which should properly sell in lower price strata.

With regard to comparative prices, it was stated that steel pipe manufacturers for the most part followed the practice of finding general costs per ton only, without finding separate costs for different sizes. In explanation it was suggested that the steel pipe people had always made good money, and had not needed to follow costs with such care. Griffin and Company believed, however, that for the reasons stated it was distinctly worth while to do so, and that the trouble of weighing the product at different points was less than some people supposed, as well as being helpful for production control and for price making, especially because advertised standards of pipe permit only certain variations of weight over or under the standard weight per foot. The variations in cost per ton for the different sizes, finishes and threads amounted to several dollars per ton, more than could be ignored in a closely competitive market. Sizes varied from ¼-inch[1] to 12 inches, and in addition there were extra heavy, i.e., with walls about twice as thick as standard, and double extra heavy, in which the walls were about four times standard thickness. Sizes from ¼ to 2½ inches were made in one furnace, constituting one department for cost purposes, with its own furnace-hour rate, based on a normal operating load which was 80% of capacity. Sometimes there were items of cost, such as special labor bonuses, which could not be applied correctly as part of the general furnace-hour rate, since they were paid for specific sizes made; but it was easy to apply these direct to the size affected. By recording the number of hours worked on a size, the pounds of good production,[2] partly finished product and of scrap, a cost per foot was obtained for that size. Scrap and partly finished pipe were credited at various standard prices, and records were to show how actual quantities of scrap on the different runs compared with the standard allowance. The difference between the charge in value and the standard prices was an operating loss absorbed by the good production of the run. In the finishing department costs were applied by machine-hour rate; the inspection department also used an hourly rate, a man-hour rate, which was charged to the different sizes according to the time devoted to them.

ZINC COSTS IN GALVANIZING

Another problem which had engaged their attention was to determine the cost of zinc used in galvanizing pipe. The general plan had been to determine the quantity of zinc used, divide this by the tons produced and thus secure a cost per ton for all sizes, but this resulted in error, the heavy sizes being overloaded because the heavier pipe had thicker walls and less surface to cover. Others had charged for zinc on the basis of the square surface covered, but there were variables in the condition of the zinc, the temperature, and such factors. Griffin and Company, therefore, adopted the practice of weighing the pipe before and after galvanizing. The weight of zinc added amounted to from 240 to 400 pounds per ton of pipe, and since zinc cost about 6 cents per pound the amount involved was considerable. The weighing was useful not only for costing, but also aided the control of the processing. The weight before galvanizing was the production of the department, from which the pipe came, and was therefore a desirable figure to have; the weight after galvanizing provided a record of the product at that stage.

---

[1] This pipe, while nominally of ¼-inch bore, was actually a little larger than that, following the practice of all pipe manufacturers.

[2] Partly finished product refers to slightly defective work which can be corrected.

PURCHASE OF ORE OR PIG

As already stated, the company both made and purchased pig; from time to time question would arise as to which of these courses to follow. If ore was bought, it had to be shipped in while the lakes were open, thus accumulating a considerable inventory of ore; then when the ore was converted, a heavy inventory of pig iron remained for a period. These facts had to be taken into account in comparing the costs, as well as the fact that the company's own blast furnaces might be left idle if more than a certain quantity of pig were bought.

USE OF PLANT LEDGER

Contrary to what seems to be general practice in the iron and steel industry Griffin and Company operated a Plant Ledger. Its purposes in so doing were (1) to get an exact depreciation charge per month; (2) to obtain the departmental charge which was essential if correct departmental costs were to be had; (3) to make book entries at exact figures when plant items were sold or transferred from one department to another; (4) to compile correct departmental inventories of plant, which were checked by the departmental managers responsible for them.

Outline a form of cost sheet to show the cost to make and sell a given size of pipe, per ton and per foot.

What comparative figures would be desirable in determining whether to make or to buy pig?

Do you approve of the company's practice of gathering regular costs on each size of pipe?

Was it necessary to weigh all pipe to get correct costs of galvanizing?

Do you approve the use of standard costs as a basis for price-making?

Would the "budgeted profits" for all lines, as computed, add up to the total net profit of the month?

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